Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations: June 2022 July

D.J.Y.B. Tech (Civil) Sem IV

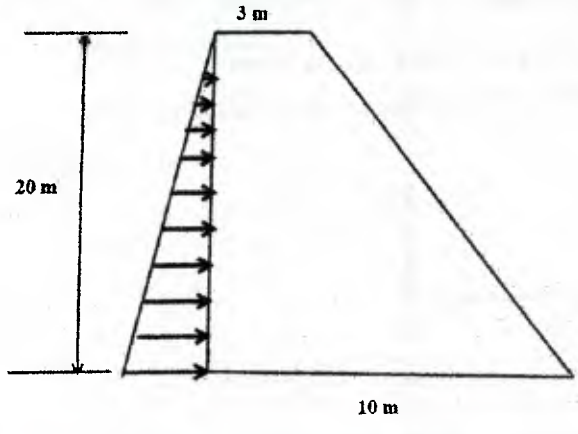
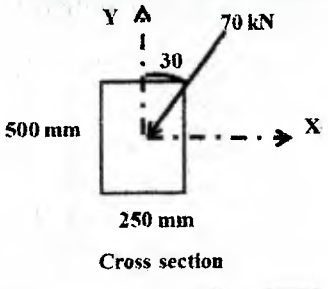
Program: B.Tech. in Civil Engineering **Duration: 3 Hours**

Course Code: PC-BTC402 **Maximum Points: 100**

Course Name: Structural Mechanics **Semester: IV**

6/7/22

1. Attempt any FIVE questions out of SEVEN questions.
2. **Answers to all sub questions should be grouped together.**
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary and state the same clearly.

Q.No.	Questions	Points	CO	BL	PI
Q.1(a)	**A 20 m high masonry dam of trapezoidal cross section ABCD has the top and bottom widths of 3m and 10m respectively as shown in figure below. The dam retains water on its vertical face to a depth of 20 m. Determine the maximum and minimum stresses developed at the base of the dam.** **The unit weight of masonry is 22 kN/m^3 and that of water is 10 kN/m^3.**	10	1	4	1.1.1 1.3.1 2.4.1
					
Q.1(b)	**A simply supported beam of span 10 m, is subjected to a central point load of 70 kN at an angle of 30° with Y axis as shown in figure below. The cross section of the beam is a rectangle of width 250 mm and depth 500 mm. (i) Find the maximum bending moment and state its location. Show this moment vector in the cross section. (ii) Find the location of the neutral axis and show it in the cross section. Find the maximum and minimum bending stresses and state their location in the cross section.**	10	1	4	1.1.1 1.3.1 2.4.1
	 Cross section				

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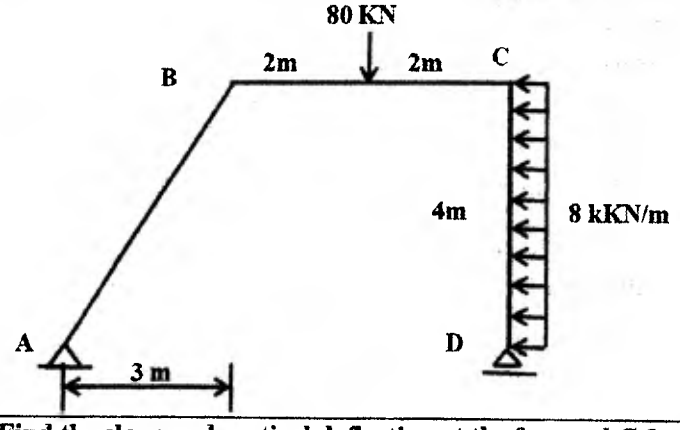
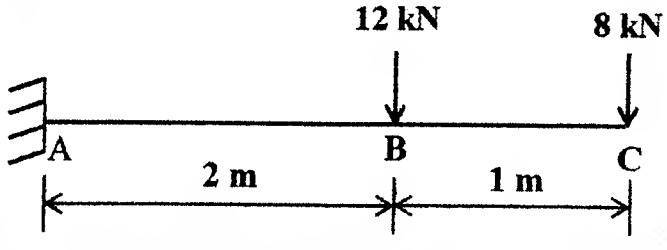
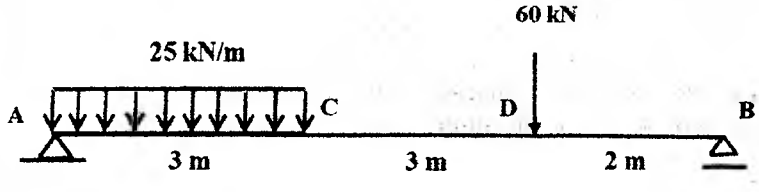
Q.2(a)	**Write the expression for strain energy stored in a member due to** **(i) Shear force** **(ii) Twisting Moment** **Explain the terms involved in each expression**	05	2	2	1.3.1
Q.2(b)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD**	15	2	3,4	1.3.1 2.1.3
					
Q.3(a)	**Find the slope and vertical deflection at the free end C for the beam supported and loaded as shown in figure below. Use conjugate method only.**	10	3	3,4	1.3.1 2.1.3
					
Q.3(b)	**Find the slope and vertical deflection at C for the beam supported and loaded as shown in figure below. Use moment area method only.**	10	3	3,4	1.3.1 2.1.3
					

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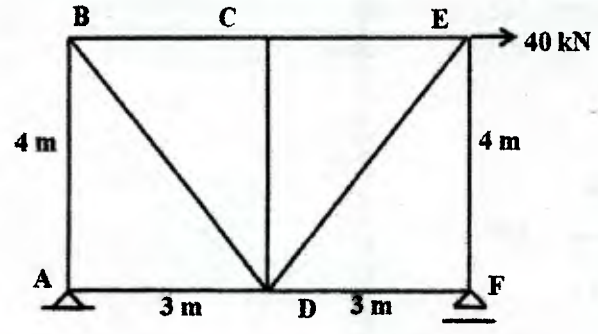
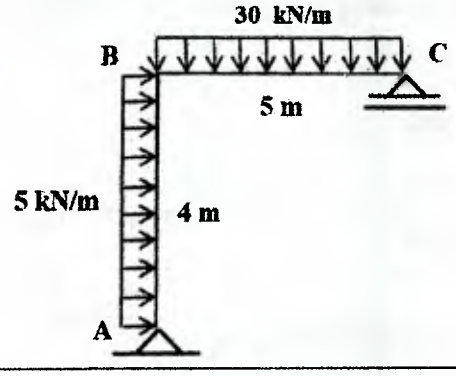
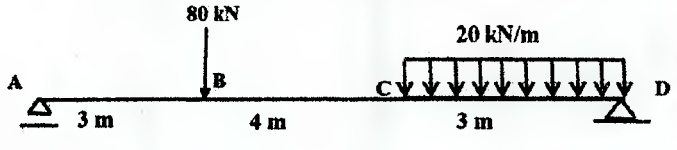
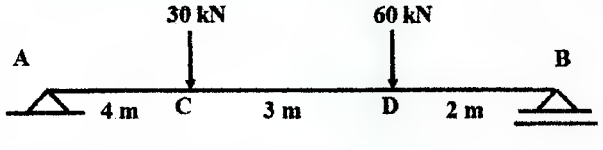
End Semester Examinations: ~~June~~ July 2022

Q.4(a)	**For the pin jointed frame loaded as shown in figure below, find the horizontal deflection of joint E.**	12	3	3,4	1.3.1 2.1.3
					
Q.4(b)	**Determine the horizontal deflection of point C of the rigid jointed frame loaded as shown in figure below.**	8	3	3,4	1.3.1 2.1.3
					
Q.5(a)	**Using <u>Macaulay's method only</u>, find the slope and vertical deflection at D for the beam supported and loaded as shown in figure below.**	10	3	3,4	1.1.1 1.3.1 2.4.1
					
Q.5(b)	**Find the strain energy stored <u>due to bending moment only</u> for the beam loaded as shown in the figure below.**	10	2	3,4	1.1.1 1.3.1 2.4.1
					

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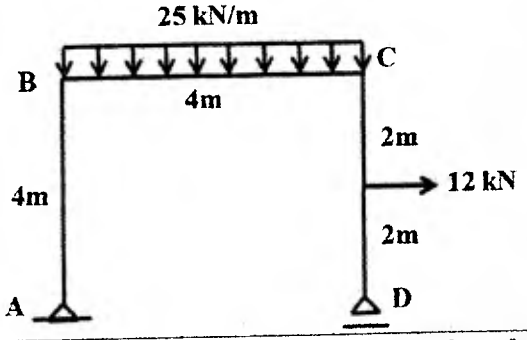
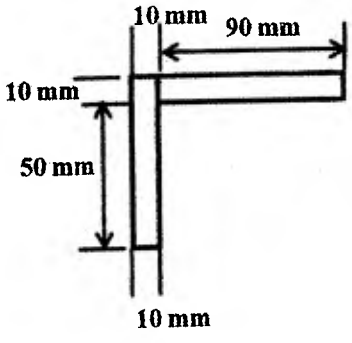
Q.6(a)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD <u>for members AB and BC only</u>**	10	4	3,4	1.1.1 1.3.1 2.4.1
					
Q.6(b)	**Find the crippling loads using (i) Euler's and (ii) Rankine's formulae for a steel column 3.0 m long with both ends hinged. The cross section of the column is a symmetrical I section with the following dimensions.** **Top and bottom Flange width = 250 mm,** **Top and bottom Flange thickness = 25 mm,** **Depth of web = 300 mm, Thickness of web = 30 mm.** **Take $E = 2 \times 10^5$ N/mm², f_c = 350 MPa and** **Rankine's constant = 1/7000.**	10	4	3,4	1.1.1 1.3.1 2.4.1
Q.7(a)	**(i) Name the methods of finding deflection in trusses.**	02	3	2	1.3.1
	(ii) State and explain Bette's theorem.	05	2	2	1.3.1
	(iii) Nam the factors which determine the Euler's buckling load of a member subjected to an axial force?	03	4	2	1.3.1
Q.7(b)	**Locate the principal axes and find the principal moments of inertia for the angle section shown in figure below.**	10	1	3,4	1.1.1 1.3.1 2.4.1
					

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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations: May 2022

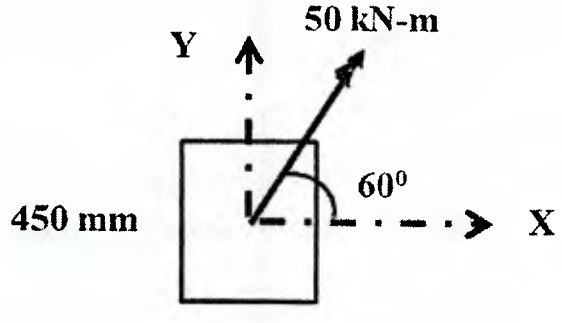
S.Y. B.Tech (Civil) Sem IV 19/5/22

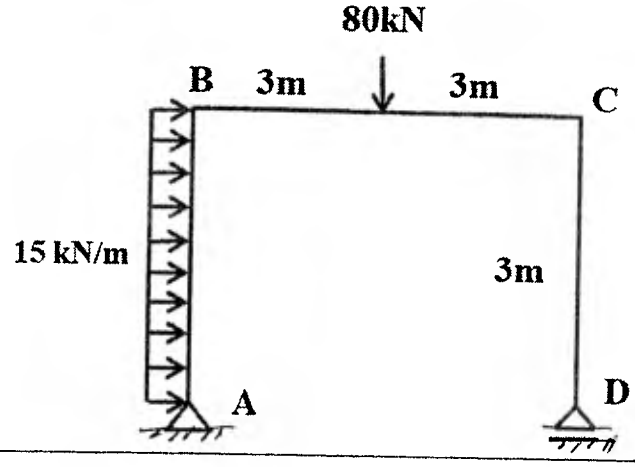
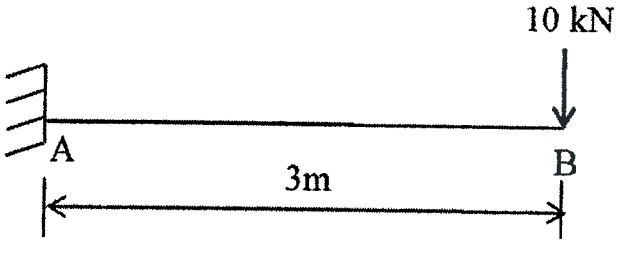
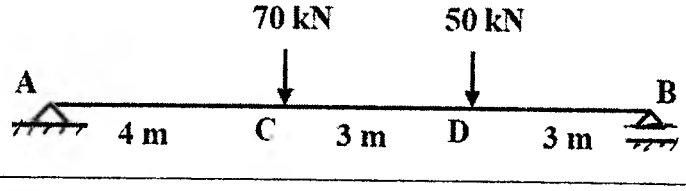
Program: B.Tech. in Civil Engineering **Duration: 3 Hours**

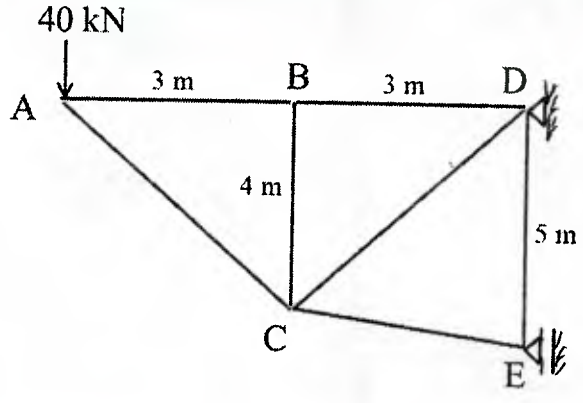
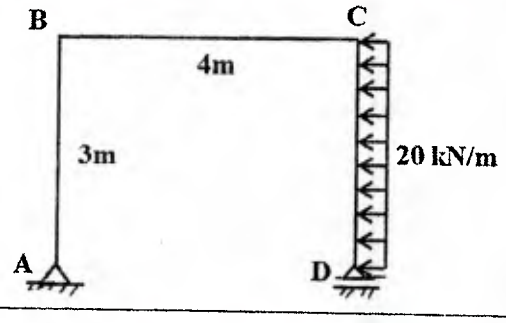
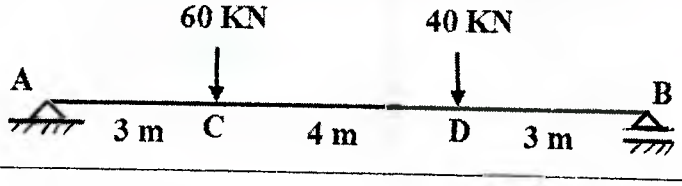
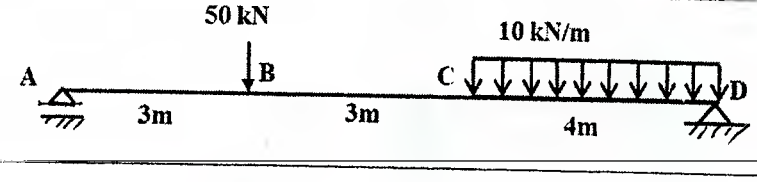
Course Code: PC-BTC402 **Maximum Points: 100**

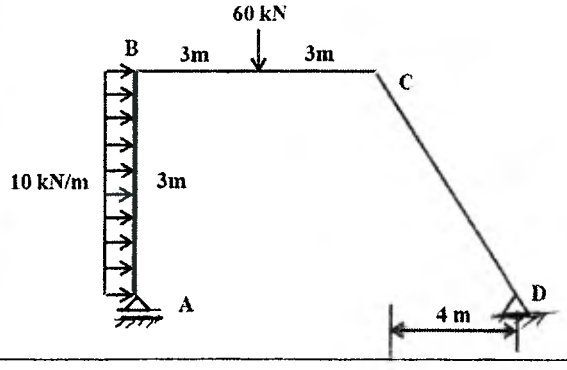
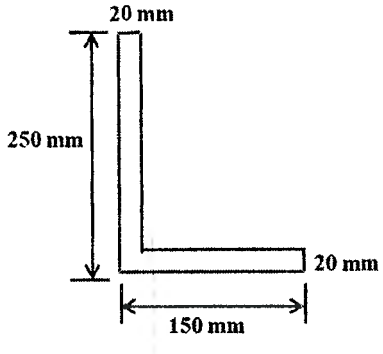
Course Name: Structural Mechanics **Semester: IV**

1. Attempt any FIVE questions out of SEVEN questions.
2. **Answers to all sub questions should be grouped together.**
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary and state the same clearly.

Q.No.	Questions	Points	CO	BL	PI
Q.1(a)	**A cylindrical steel chimney of 45 meters height and 2 meters external diameter and 0.8 meter internal diameter is exposed to a horizontal wind pressure, the intensity of which varies as the square root of the height above the ground. At a height of 25 m, the intensity of wind pressure on a flat surface is 2.5 kN/m^2 and the co-efficient of wind resistance is 0.62. Calculate the maximum and minimum stress intensities at the base. The density of steel is 78.5 kN/m^3.**	10	1	4	1.1.1 1.3.1 2.4.1
Q.1(b)	**A rectangular cross section of width 250 mm and depth 450 mm is subjected to a bending moment of 50 kN-m at 60 degrees to the positive X axis as shown in the figure below. Find the location of the neutral axis and show it in the cross section. Find the maximum and minimum bending stresses and state their location in the cross section.**	10	1	4	1.1.1 1.3.1 2.4.1
	 **Cross section**				
Q.2(a)	**Write the expression for strain energy stored in a member due to (i) Axial force (ii) Bending Moment Explain the terms involved in each expression**	05	2	2	1.3.1

Q.2(b)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD**	15	2	3,4	1.3.1 2.1.3
					
Q.3(a)	**Find the slope and vertical deflection at the free end B for the beam supported and loaded as shown in figure below. Use conjugate method only.**	10	3	3,4	1.3.1 2.1.3
					
Q.3(b)	**Find the slope and vertical deflection at C for the beam supported and loaded as shown in figure below. Use moment area method only.**	10	3	3,4	1.3.1 2.1.3
					

Q.4(a)	**For the pin jointed frame loaded as shown in figure below, find the vertical deflection of joint A.**	10	3	3,4	1.3.1 2.1.3
					
Q.4(b)	**Determine the horizontal deflection of point D of the rigid jointed frame loaded as shown in figure below.**	10	3	3,4	1.3.1 2.1.3
					
Q.5(a)	**Using Macaulay's method only, find the slope and vertical deflection at D for the beam supported and loaded as shown in figure below.**	10	3	3,4	1.1.1 1.3.1 2.4.1
					
Q.5(b)	**Find the strain energy stored due to bending moment only for the beam loaded as shown in the figure below.**	10	2	3,4	1.1.1 1.3.1 2.4.1
					

Q.6(a)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD for member CD only**	10	4	3,4	1.1.1 1.3.1 2.4.1
					
Q.6(b)	**Compare the crippling loads given by Euler's and Rankine's formulae for a steel column 4.0 m long with both ends fixed. The cross section of the column is a symmetrical I section with the following dimensions.** **Top and bottom Flange width = 300 mm,** **Top and bottom Flange thickness = 20 mm,** **Depth of web = 400 mm, Thickness of web = 40 mm.** **Take E = $2x10^5$ N/mm^2, f_c = 350 MPa and** **Rankine's constant = 1/7000.**	10	4	3,4	1.1.1 1.3.1 2.4.1
Q.7(a)					
	(i) Name the methods of finding deflection in structures.	03	3	2	1.3.1
	(ii) State and explain Maxwell's reciprocal theorem.	04	2	2	1.3.1
	(iii) What are the limitations of Euler's formula for buckling load of a column?	03	4	2	1.3.1
Q.7(b)	**Locate the principal axes and find the principal moments of inertia for the angle section shown in figure below.**	10	1	3,4	1.1.1 1.3.1 2.4.1
					

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End Semester Examinations: May 2022 19/5/22

Program: B.Tech. in Civil Engineering S.Y. B.Tech (Civil) Sem IV **Duration: 3 Hours**

Course Code: PC-BTC402 **Maximum Points: 100**

Course Name: Structural Mechanics **Semester: IV**

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Q.No.	Questions	Points	CO	BL	PI
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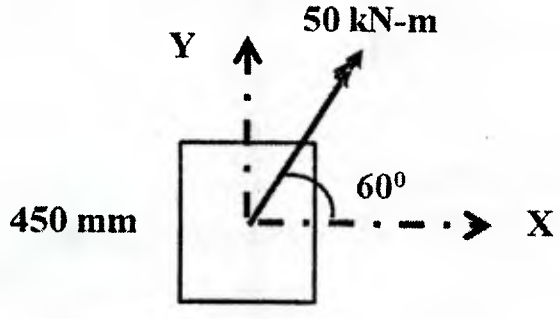
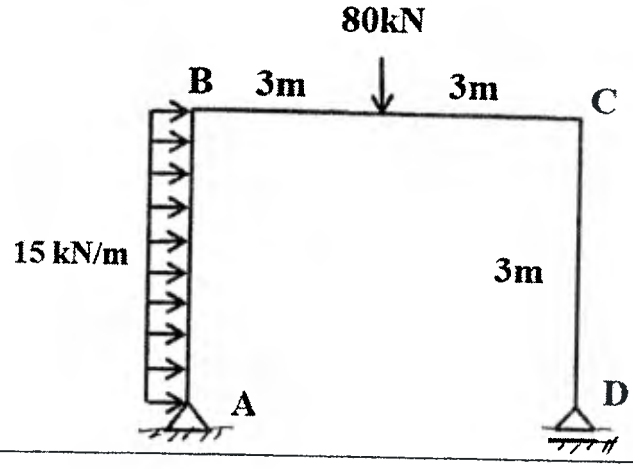
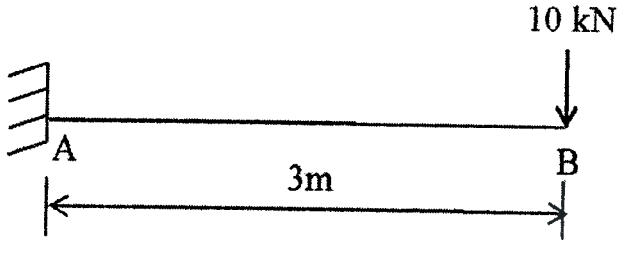
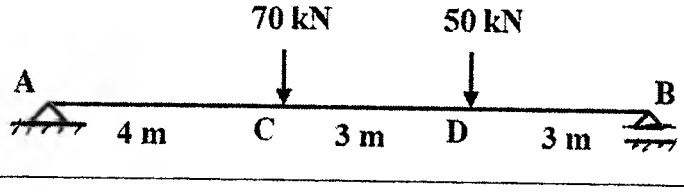
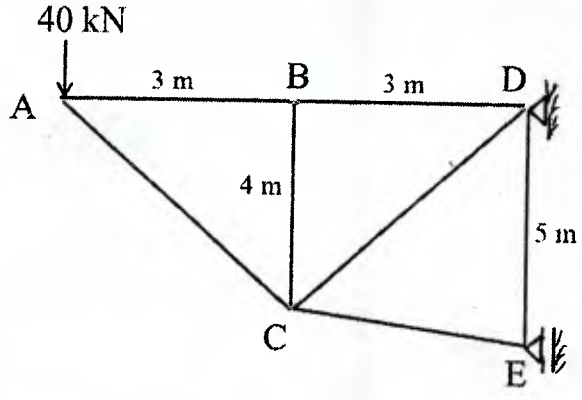
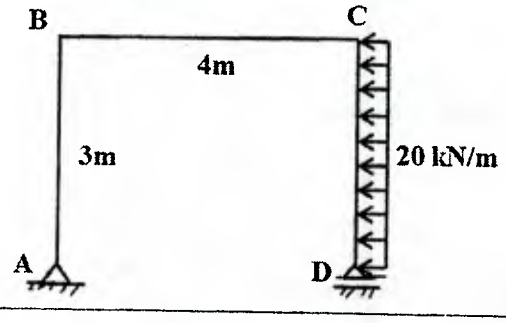
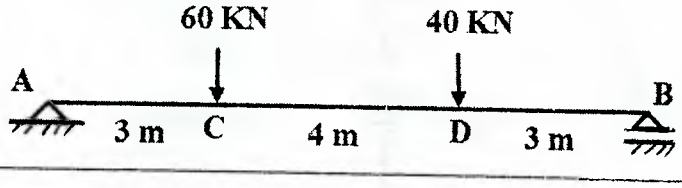
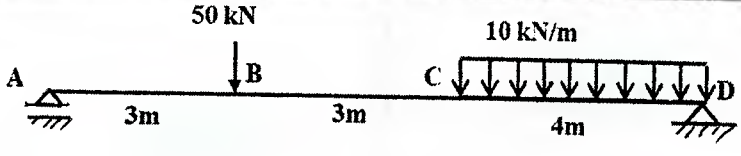
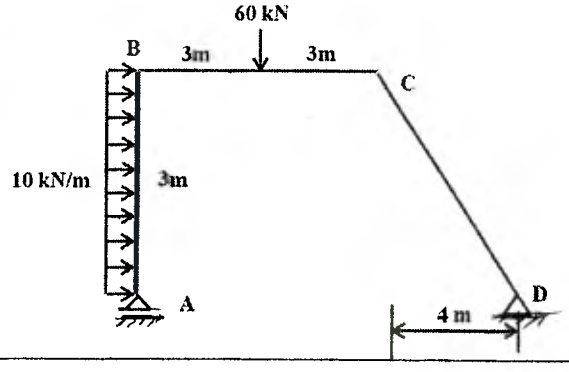
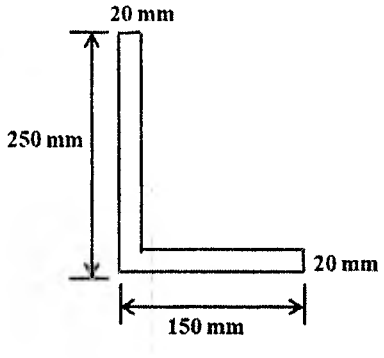
Q.1(b)	**A rectangular cross section of width 250 mm and depth 450 mm is subjected to a bending moment of 50 kN-m at 60 degrees to the positive X axis as shown in the figure below. Find the location of the neutral axis and show it in the cross section. Find the maximum and minimum bending stresses and state their location in the cross section.**	10	1	4	1.1.1 1.3.1 2.4.1
	 **Cross section**				
Q.2(a)	**Write the expression for strain energy stored in a member due to (i) Axial force (ii) Bending Moment Explain the terms involved in each expression**	05	2	2	1.3.1

Q.2(b)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD**	15	2	3,4	1.3.1 2.1.3
					
Q.3(a)	**Find the slope and vertical deflection at the free end B for the beam supported and loaded as shown in figure below. Use conjugate method only.**	10	3	3,4	1.3.1 2.1.3
					
Q.3(b)	**Find the slope and vertical deflection at C for the beam supported and loaded as shown in figure below. Use moment area method only.**	10	3	3,4	1.3.1 2.1.3
					

Q.4(a)	**For the pin jointed frame loaded as shown in figure below, find the vertical deflection of joint A.**	10	3	3,4	1.3.1 2.1.3
					
Q.4(b)	**Determine the horizontal deflection of point D of the rigid jointed frame loaded as shown in figure below.**	10	3	3,4	1.3.1 2.1.3
					
Q.5(a)	**Using Macaulay's method only, find the slope and vertical deflection at D for the beam supported and loaded as shown in figure below.**	10	3	3,4	1.1.1 1.3.1 2.4.1
					
Q.5(b)	**Find the strain energy stored due to bending moment only for the beam loaded as shown in the figure below.**	10	2	3,4	1.1.1 1.3.1 2.4.1
					

Q.6(a)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD <u>for member CD only</u>**	10	4	3,4	1.1.1 1.3.1 2.4.1
					
Q.6(b)	**Compare the crippling loads given by Euler's and Rankine's formulae for a steel column 4.0 m long with both ends fixed. The cross section of the column is a symmetrical I section with the following dimensions.** **Top and bottom Flange width = 300 mm,** **Top and bottom Flange thickness = 20 mm,** **Depth of web = 400 mm, Thickness of web = 40 mm.** **Take E = $2x10^5$ N/mm^2, f_c = 350 MPa and** **Rankine's constant = 1/7000.**	10	4	3,4	1.1.1 1.3.1 2.4.1
Q.7(a)					
	(i) Name the methods of finding deflection in structures.	03	3	2	1.3.1
	(ii) State and explain Maxwell's reciprocal theorem.	04	2	2	1.3.1
	(iii) What are the limitations of Euler's formula for buckling load of a column?	03	4	2	1.3.1
Q.7(b)	**Locate the principal axes and find the principal moments of inertia for the angle section shown in figure below.**	10	1	3,4	1.1.1 1.3.1 2.4.1
					

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

Re-Exam **End Semester Examinations: July 2022**

S.Y. B.Tech (Civil) Sem IV

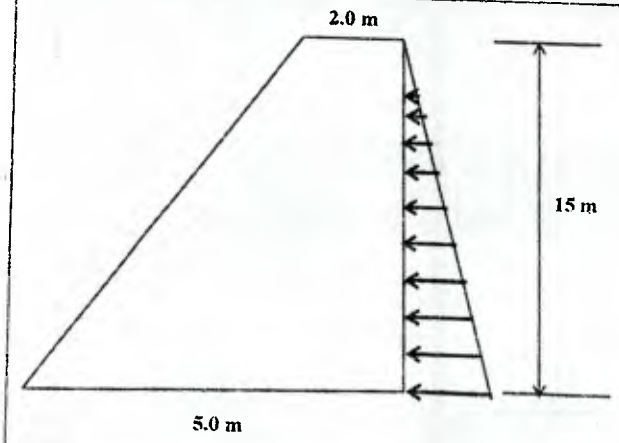
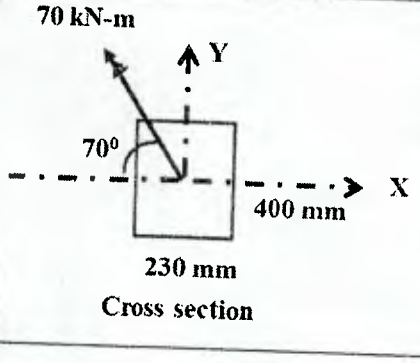
Program: B.Tech. in Civil Engineering **Duration: 3 Hours**

Course Code: PC-BTC402 **Maximum Points: 100**

Course Name: Structural Mechanics **Semester: IV**

8/7/22

1. Attempt any FIVE questions out of SEVEN questions.
2. **Answers to all sub questions should be grouped together.**
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary and state the same clearly.

Q.No.	Questions	Points	CO	BL	PI
Q.1(a)	**A 15 m high masonry dam of trapezoidal cross section has the top and bottom widths of 2m and 5m respectively as shown in figure below. The dam retains water on its vertical face to a depth of 15 m. Determine the maximum and minimum stresses developed at the base of the dam. The unit weight of masonry is 20 kN/m^3 and that of water is 10 kN/m^3.**	10	1	4	1.1.1 1.3.1 2.4.1
					
Q.1(b)	**A rectangular cross section of width 230 mm and depth 400 mm is subjected to a bending moment of 70 kN-m at 70 degrees to the negative X axis as shown in the figure below. Find the location of the neutral axis and show it in the cross section. Find the maximum and minimum bending stresses and state their location in the cross section.**	10	1	4	1.1.1 1.3.1 2.4.1
	 Cross section				

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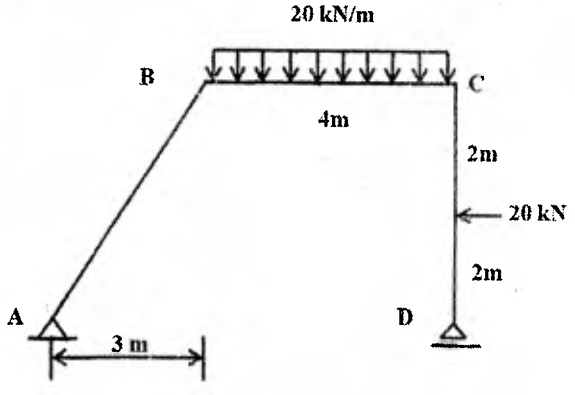
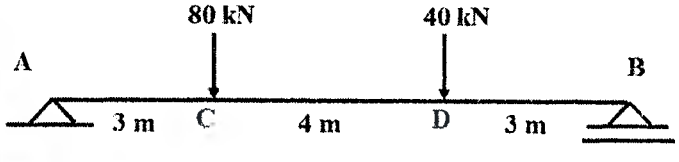
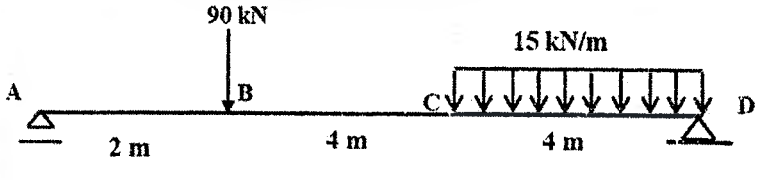
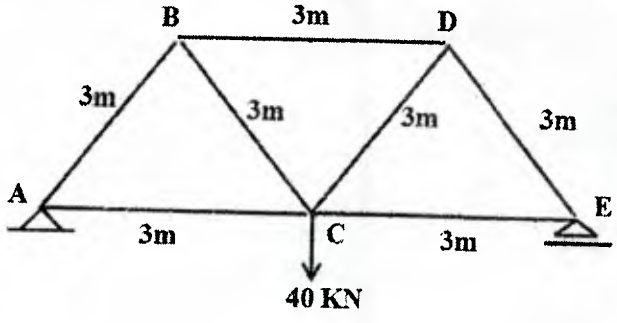
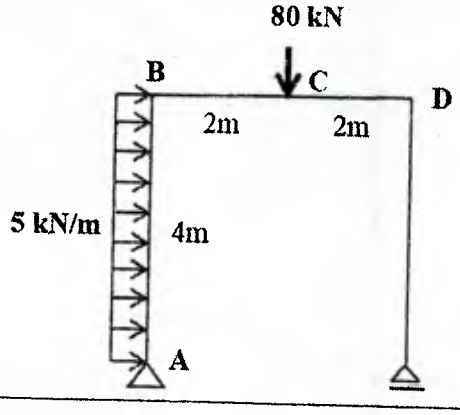
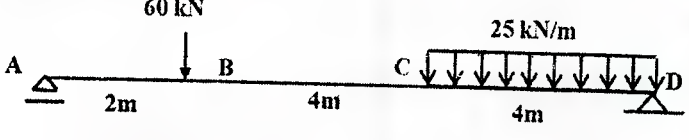
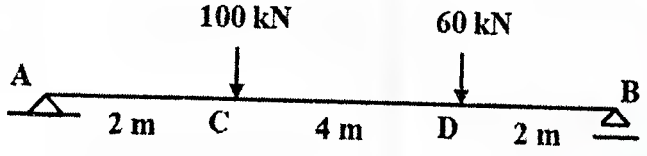
Re Exam **End Semester Examinations: July 2022**

Q.2(a)	**State and explain Maxwell's reciprocal theorem.**	05	2	2	1.3.1
Q.2(b)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD**	15	2	3,4	1.3.1 2.1.3
					
Q.3(a)	**Find the slope and vertical deflection at D for the beam supported and loaded as shown in figure below. Use conjugate method only.**	10	3	3,4	1.3.1 2.1.3
					
Q.3(b)	**Find the slope and vertical deflection at B for the beam supported and loaded as shown in figure below. Use moment area method only.**	10	3	3,4	1.3.1 2.1.3
					

Q.4(a)	**For the pin jointed frame loaded as shown in figure below, find the vertical deflection of joint C.**	10	3	3,4	1.3.1 2.1.3
					
Q.4(b)	**Determine the vertical deflection of point C of the rigid jointed frame loaded as shown in figure below.**	10	3	3,4	1.3.1 2.1.3
					
Q.5(a)	**Using Macaulay's method only, find the slope and vertical deflection at D for the beam supported and loaded as shown in figure below.**	10	3	3,4	1.1.1 1.3.1 2.4.1
					
Q.5(b)	**Find the strain energy stored due to bending moment only for the beam loaded as shown in the figure below.**	10	2	3,4	1.1.1 1.3.1 2.4.1
					

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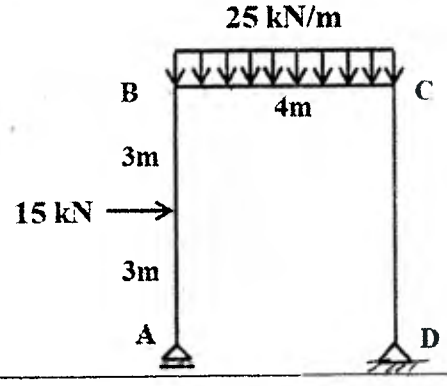
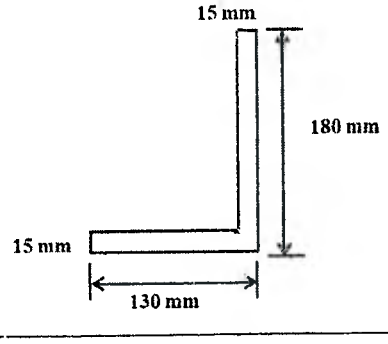
Re-Exam- **End Semester Examinations: July 2022**

Q.6(a)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **b) Draw AFD, SFD & BMD <u>for member CD only</u>**	10	4	3,4	1.1.1 1.3.1 2.4.1
					
Q.6(b)	**Compare the crippling loads given by Euler's and Rankine's formulae for a steel column 3.0 m long with both ends hinged. The cross section of the column is a symmetrical I section with the following dimensions.** **Top and bottom Flange width = 350 mm,** **Top and bottom Flange thickness = 30 mm,** **Depth of web = 300 mm, Thickness of web = 30 mm.** **Take E = $2x10^5$ N/mm^2, f_c = 350 MPa and** **Rankine's constant = 1/7000.**	10	4	3,4	1.1.1 1.3.1 2.4.1
Q.7(a)					
	(i) Name the methods of finding deflection in trusses.	02	3	2	1.3.1
	(ii) Write the expression for the strain energy stored in a member due to **(a) Axial force** **(b) Shear force** **Explain the terms involved in each expression**	04	2	2	1.3.1
	(iii) Explain how the buckling load carrying capacity of a compression member can be increased.	04	4	2	1.3.1
Q.7(b)	**Locate the principal axes and find the principal moments of inertia for the angle section shown in figure below.**	10	1	3,4	1.1.1 1.3.1 2.4.1
					

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai - 400058

End Semester Direct Second Year - July 2022 Examinations

D.S.Y. B.Tech (Civil) Sem IV

Program: B. Tech. Civil Engineering | **Duration: 3hrs.**

Course Code: PE-BTC404 | **Maximum Points: 100**

Course Name: Surveying & Geomatics | **Semester: IV**

11/7/22

Notes:

1. There are **TOTAL SEVEN MAIN** questions, each of **20 points.**
2. **QUESTION 1 is COMPULSORY.**
3. **From the remaining SIX Questions Solve ANY FOUR.**
4. **Assume suitable data, wherever necessary and State it clearly.**
5. Write **answer to each question on a new page.**
6. Answers to be accompanied with **appropriate sketches/facts & figures/table or chart/graph/diagram/flowchart** wherever necessary or required.

Q.No.	Questions	Points	CO	BL	PI
1.	**Answer the following: (2 marks each)**				
	Define: 1. Tangent distance and External distance of a simple horizontal curve 2. Shift in a transition curve and Grade of a vertical curve 3. Sounding and Range lines 4. Signal and Tower in a triangulation system 5. Remote sensing system and Image interpretation 6. Focal length and photo scale in aerial photographs 7. Total station and EDM 8. Global positioning system 9. Anallactic lens in a tacheometer 10. Horizontal and vertical control in setting out works	20	1,2,3	1,4	1.1.1
2.A	Calculate the necessary data for setting out the curve if it is intended to set out the curve by Rankine's method of tangential angles. If the theodolite has a least count of 20", tabulate the actual readings of deflection angles to be set out. Give data: Chainage of point of intersection 1192m. Deflection angle 50°30' Radius of the curve 300m Take peg interval of 20m.	10			
2.B	Describe briefly, with neat sketches, the location of sounding stations by means of 1) Cross rope sounding (5) 2) Intersecting ranges (5)	10			
3.A	Enlist the instruments used for setting out works (3). Explain the method of locating the centre line of a bridge by triangulation method (7)	10			
3.B	Explain, with neat sketch, the fixed hair method / stadia method for tacheometric measurements (5) and derive the stadia equation for a	10			

	line of sight perpendicular to the staff intercept (5).					
4.A	Explain in short the following for a triangulation system: (any two) 1. Baseline measurement 2. Strength of a figure 3. Base net 4. Use of Signals and towers	10				
4.B	A parabolic vertical curve is to be set out connecting two unirom grades of +0.8% and 0.9%. The chainage and reduced level of point of intersection are 1664m and 238.755m respectively. The rate of change of grade is 0.05% per 20m. Calculate the chainages and reduced levels of the various stations.	10				
5.	Explain in detail, with neat sketches: (5 points each) 1. Working of a remote sensing system 2. Types of GPS 3. Relief displacement 4. Electromagnetic spectrum in EDM	20				
6.A	1. State various methods of determining the length of transition curve (1). Explain any one method in detail (2). 2. Explain the concept of 'Super-elevation' (3). 3. A transition curve is required for a circular curve of 200m radius. The gauge being 1.5m and maximum super-elevation restricted to 15cm. the transition is to be designed for a speed such that no lateral pressure is imposed on the rails and the rate of gain of radial acceleration is 30cm/s3. Calculate the required length of the transition curve (3) and the design speed (3).	12				
6.B	Explain the method of 'Reduction to centre' by establishing a satellite station	8				
7	Write short notes on: (any two – 10 marks each) a. Non-registering or Self registering tide gauges b. Primary, secondary and tertiary triangulation methods c. Laying the plan of a new structure w.r.t some permanent features d. Errors in stadia measurement	20				

----- The End -----

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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester May 2022 Examinations

23/5/22

Program: B. Tech. Civil Engineering S.Y. B. Tech (Civil) IV Sem IV **Duration: 3hrs.**

Course Code: PE-BTC404 **Maximum Points: 100**

Course Name: Surveying & Geomatics **Semester: IV**

Notes:

1. There are **TOTAL SEVEN MAIN** questions, each of **20 points**.
2. **QUESTION 1 is COMPULSORY.**
3. **From the remaining SIX Questions Solve ANY FOUR.**
4. **Assume suitable data, wherever necessary and State it clearly.**
5. Write **answer to each question on a new page.**
6. Answers to be accompanied with **appropriate sketches/facts & figures/table or chart/graph/diagram/flowchart** wherever necessary or required.

<table>
<tr><th>Q.No.</th><th>Questions</th><th>Points</th><th>CO</th><th>BL</th><th>PI</th></tr>
<tr><td>1.</td><td>Answer the following: (2 marks each)</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>1. Differentiate between Triangulation and Trilateration (only 2 points)
2. Define: Principal Point and Nadir
3. Distinguish between Metric and Interpretive aerial photogrammetry (only 2 points)
4. Differentiate between Internal focusing and external focusing theodolite
5. Define Super-elevation and give the formula for finding super-elevation.
6. State the basic principle of positioning in GPS. State the two types of position fixing in a GPS.
7. Define: a) Tides b) Sounding
8. State the two methods of EDM. Give the relationship between wavelength and frequency.
9. Differentiate between Active & Passive Remote sensing
10. Give the elements of Reverse curve – when the straights are non-parallel.</td><td>20</td><td>1,2,3</td><td>4
1
4
4
1
1
1
1
4
1</td><td>1.1.1</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.A</td><td>Given the data as shown here:
<table>
<tr><th>Inst. stn</th><th>Staff stn</th><th>Line</th><th>Bearing</th><th>Vertical angle</th><th>Stadia readings</th></tr>
<tr><td>O</td><td>A</td><td>OA</td><td>84°36'</td><td>3°30'</td><td>1.35, 2.10, 2.85</td></tr>
<tr><td>O</td><td>B</td><td>OB</td><td>142°24'</td><td>2°45'</td><td>1.955, 2.875, 3.765</td></tr>
</table>
Find the distance between stations A & B and the gradient between stations A & B.
Staff held normal at both the stations</td><td>10</td><td>1,3</td><td>3</td><td>1.1.2</td></tr>
<tr><td>2.B</td><td>For the circular curve to be provided on a railway line, a transition curve is to be provided at its both ends. Following data is available:
Radius of circular curve – 300m
Rail gauge – 1.5m
Super-elevation – 15cm
Rate of change of radial acceleration – 0.3m/s^3</td><td>5</td><td>2,3</td><td>3</td><td>1.1.2</td></tr>
</table>

	Design: Design speed of the vehicle (1), Length of the transition (2) curve, Spiral angle (1) and Shift (1) of the transition curve6				
2.C	Draw a neat sketch and show the range line, sounding points and shore line (2) State the essential points to be considered while planning the sounding points. (3)	**5**	**1,3**	**1** **2**	**1.1.1**
3.A	a) Explain, with the help of a neat sketch, the 'Tangent Correction method' of setting out Vertical curve. (4) b) Calculate the chainages of the tangent point and the apex of the vertical curve connecting two grades of +0.6% and -0.9%. The chainages and the RL of intersection point are 985.5m and 1430m respectively. The rate of change of grade for the curve is 0.75 % per 30m. (6)	**10**	**1,3**	**2** **3**	**1.1.2**
3.B	State and explain various errors in stadia measurement in a tacheometric survey.	**5**	**1,3**	**2**	**1.1.1**
3.C	Give the importance of setting out works with an appropriate example. (3) State the prerequisites for locating a new structure w.r.t the permanent structures. (2)	**5**	**1,2**	**1** **2**	**1.1.1**
4.A	Classify (in detail) the aerial photographs on the basis of alignment of optical axis.	**8**	**1,3**	**2**	**5.1.1**
4.B	State various figures of triangulation (1). With neat sketches, explain the figures (5).	**6**	**1,3**	**1** **2**	**1.1.1**
4.C	Explain where and how the Echo sounding machine / Fathometer is used to measure the depth of the water in a water body. (4) Give the advantages of using the echo sounding machine / Fathometer. (2)	**6**	**1,3**	**2**	**5.1.1**
5.A	Explain 'Stereoscopic parallax' (4) and explain how absolute and differential parallax can be used to obtain the height of the object (4).	**8**	**1,3**	**2**	**1.1.1**
5.B	State the characteristics of Electromagnetic (EM) waves.	**4**	**1,3**	**1**	**5.1.1**
5.C	Explain the basic procedure for setting out the foundation of a structure on a given site as per the plans.	**8**	**1,2**	**2**	**1.1.1**
6.A	State and explain different types of Image interpretation (3). State various elements of Image interpretation (2) and explain any one element of interpretation with an appropriate example (3).	**8**	**1,3**	**2**	**5.1.1**
6.B	State and explain the criteria for selection of figure for triangulation survey.	**6**	**1,3**	**2**	**1.1.1**
6.C	With neat sketches, explain the method of sounding: i) By range and one angle from boat (3) ii) By two angles from shore (3)	**6**	**1,3**	**2**	**5.1.1**
7.A	i) Aerial photographs were taken with a camera having a focal length of 180mm. the average elevation of the ground in the photograph was	**8**	**1,3**	**3**	**5.1.1**

	160m. Find: a) scale of the map if the flying height was 2500m. (2) b) the flying height required to have a photo scale of 1 in 6000. (2) ii) Find the number of photographs required of size 250mm x 250mm to cover an area of 20km x 16km, if the longitudinal overlap is 60% and the side overlap is 30%. Scale of the photograph is 1cm = 150m. (4)				
7.B	Give the difference between Electronic theodolite, EDM and Total station. (atleast 4 points)	**4**	**1,3**	**4**	**5.1.1**
7.C	Explain the method of achieving horizontal and vertical control in setting out works.	**8**	**1,2**	**2**	**1.1.1**

----- The End -----

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester July 2022 Examinations

S.Y. B.Tech Civil Sem IV

Program: B. Tech. Civil Engineering | **Duration: 3hrs.**

Course Code: PE-BTC404 | **Maximum Points: 100**

Course Name: Surveying & Geomatics | **Semester: IV**

11/7/22

Notes:

1. There are **TOTAL SEVEN MAIN** questions, each of **20 points**.
2. **QUESTION 1 is COMPULSORY.**
3. **From the remaining SIX Questions Solve ANY FOUR.**
4. **Assume suitable data, wherever necessary and State it clearly.**
5. Write **answer to each question on a new page.**
6. Answers to be accompanied with **appropriate sketches/facts & figures/table or chart/graph/diagram/flowchart** wherever necessary or required.

Q.No.	Questions	Points	CO	BL	PI
1.	**Answer the following: (2 marks each)**				
	1. With neat sketches, define Triangulation and Trilateration. 2. Define: stereoscopic parallax 3. Distinguish between true vertical, vertical and tilted photographs 4. Differentiate between Stadia method and Non-stadia method of tacheometric measurements. 5. Define Super elevation and Sight distance, with neat sketches. 6. With neat sketches, differentiate between static single point and static relative positioning. 7. State the advantages of using total station for a land survey. 8. Explain, in short, Electromagnetic radiation spectrum. 9. State different types of resolutions in a remote sensing system. 10. Give the elements of horizontal simple circular curve, with a neat sketch.	**20**	**1,2,3**	**1,4**	**1.1.1**
2.A	A tacheometer was setup at a station P and the readings on a vertically held staff at Q were 2.255, 2.605, 2.955, the line of sight being inclined at +8°24'. Another observation on the vertically held staff at benchmark (B.M.) gave the readings 1.640, 1.920 and 2.200, the inclination of the line of sight being +1°6'. Draw neat sketch of the profile (2) and calculate: 1. Horizontal distance between P and Q (3). 2. Elevation of Q if the R.L. of B.M. is 418.685m (5). Take the tacheometric constants as 100 and 0.3.	**10**	**1,3**	**3**	**1.1.2**
2.B	Two tangents intersect at chainage 1192m, the deflection angle being 50°30'. Calculate the necessary data for setting out a curve of 15 chains by offsets from chord. Take peg interval equal to one chain. The length of the chain is equal to 20m.	**5**	**2,3**	**3**	**1.1.2**
2.C	State various methods of locating the soundings (2). Explain with a neat sketch the method of sounding location by Cross-rope (3).	**5**	**1,3**	**1 2**	**1.1.1**

3.A	A road bend which deflects 80o is to be designed for a maximum speed of 100kmph, a maximum centrifugal ratio of ¼ and a maximum rate to the change of acceleration of 30cm/sec3, the curve consisting of a circular arc combined with two cubic spirals. Calculate 1) Radius of the circular arc (2), 2) Required length of transition curve (1), 3) Total length of combined, circular and transition, curve (3), and 4) Chainages of the start and end of the transition curves, and of the junction of the transition curves with the circular arc, if the chainage of the point of intersection is 42862m (4).	**10**	**1,3**	**3**	**1.1.2**
3.B	State the principle of stadia method (1). Explain the procedure for finding the tacheometric constants (4).	**5**	**1,3**	**1** **2**	**1.1.1**
3.C	Explain how horizontal control and vertical control is important for setting out works.	**5**	**1,2**	**2**	**1.1.1**
4.A	Explain with a neat sketch how the scale of vertical photograph can be determined (4). Give the steps for Computation of a flight plan for aerial photography (4).	**8**	**1,3**	**2** **1**	**5.1.1**
4.B	State the purpose of 'Triangulation survey' (3). Classify the triangulation methods (3).	**6**	**1,3**	**1** **2**	1.1.1
4.C	Write a note on "Use of Shore signals and Buoys for taking the sounding".	**6**	**1,3**	**2**	5.1.1
5.A	Explain with a neat sketch: (any two) 1. Stereoscopic view (4) 2. Relief displacement (4) 3. Crab and Drift (4)	**8**	**1,3**	**2**	**1.1.1**
5.B	State and explain various remote sensing platforms (6). State the basic requirements of an ideal remote sensing system (4). Explain how a real remote sensing system differs from an ideal remote sensing system (2).	**12**	**1,3**	**1** **1** **2**	5.1.1
6.A	Define 'Image interpretation' (2). State the fundamentals of image interpretation (2). Give the elements of image interpretation (2). Give some applications of image interpretation (2).	**8**	**1,3**	**1**	**5.1.1**
6.B	Explain 'Baseline measurement for triangulation survey' (2). State the factors for selection of baseline (2). Give the methods for baseline measurement (2).	**6**	**1,3**	**2**	**1.1.1**
6.C	Explain how a tide gauge is used to determine the exact water surface level. (4) Explain any one non-registering / self-registering tide gauge (2).	**6**	**1,3**	**2**	5.1.1
7.A	The scale of an aerial photography is 1cm=100m. the photograph size is 200mm x 200mm. Determine the number of photographs required to: 1. Cover and area of 100sq.km if the longitudinal lap is 60%	**8**	**1,3**	3	5.1.1

	and side lap is 30% (3). 2. Cover and area of 10km x 10km if the longitudinal lap is 60% and side lap is 30% (3). Is the answer for both 1 and 2 same? If not why? (2)				
7.B	Write a note on 'Auto reduction tacheometer'.	**4**	**1,3**	**4**	**5.1.1**
7.C	Explain with a neat sketch any one method to transfer the levels from the surface to underground.	**8**	**1,2**	**2**	**1.1.1**

----- The End -----

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

B.E. A.Y. Tech Civil Sem IV

ENDSEM- EXAMINATION (DSY) JUNE-2022

Program: CIVIL **Duration: 03 Hours**

Course Code: BS-BTC401 **Maximum Points: 100**

Course Name: PROBABILITY & STATISTICS **Semester: IV**

4/7/22

- **Attempt any five out of seven questions**
- **Use of scientific non-programmable calculator is allowed.**

QNO.	QUESTION	POINTS	CO	BL	PI
QI a)	Let X & Y be two independent binomial variates with parameters (n_1=6,p=1/2) and (n_2=4,p=1/2) respectively. Evaluate P(X+Y)=3.	06	1	2	2.1.3
QI b)	Verify whether the following functions can be looked upon as probability density function? $f(x)=\frac{1}{2}e^{-\lvert x\rvert}, -\infty \prec x \prec \infty$	06	3	1	1.1.2
QIc)	In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: Variance of X = 9 Regression equations: $8x-10y+66=0$ $40x-18y=214$ What are i.Mean, value of x and y ii.Standard deviation of y. iii.Coefficient of correlation between x and y	08	1	1	2.1.3
QII a)	The diameters of can tops produced by a machine are normally distributed with standard deviation of 0.01 cms.At what mean diameter the machine be set that not more than 5% of the can tops produced by the machine have diameters exceeding 3 cms?	06	1	2	2.1.4
QII b)	In an examination marks obtained by students in mathematics, physics and chemistry are normally distributed with means 51,53 and 46 with standard deviations 15,12,16 respectively. Find the probability of securing total marks (i) 180 or more (ii) 90 or below	06	2	2	2.3.1
QII c)	A & B throw alternately a pair of dice whoever throw '9' first wins the game. If 'A' starts the game. What are their chances of winning?	08	1	1	2.4.1

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ENDSEM- EXAMINATION (DSY) JUNE-2022

<table>
<tr><td>QIII a)</td><td>Two bad eggs are mixed accidently with 10 good ones. Find the probability distribution of the number of bad eggs in 3, drawn at random, without replacement from this lot.</td><td>06</td><td>3</td><td>2</td><td>1.1.2</td></tr>
<tr><td>QIII b)</td><td>The sales-data of an article in six shops before and after a special promotional campaign are as under
<table>
<tr><td>Shops</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
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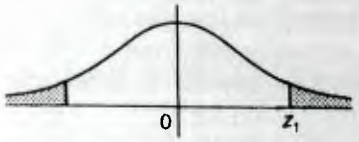
</table>
Can the campaign be judged to be a success at 5% LOS.</td><td>06</td><td>1</td><td>2</td><td>1.1.1</td></tr>
<tr><td>QIII c)</td><td>If $z = ax + by$ and 'r' is the correlation between x and y show that
$$\sigma_z^2 = a^2\sigma_x^2 + b^2\sigma_y^2 + 2abr\sigma_x\sigma_y$$
Further show that
$$r = \frac{\sigma_x^2 + \sigma_y^2 - \sigma^2_{x-y}}{2\sigma_x\sigma_y}$$
Where σ_x, σ_y and σ_{x-y} are the standard deviation of x, y and $x-y$ respectively</td><td>08</td><td>1</td><td>2</td><td>2.1.3</td></tr>
<tr><td>QIV a)</td><td>A car – hire firm has two cars, which it hires out day by day. The number of demands for a cal on each day is distributed a Poisson distribution with mean 1.5. Calculate the proportion of days on which neither car is used and the proportion of days on which some demand is refused.</td><td>06</td><td>1</td><td>3</td><td>2.3.1</td></tr>
<tr><td>QIV b)</td><td>Two salesman A and B are working in a certain districts from a sample survey conducted by the head office
Following results were obtained state whether there is any significant difference in like average sales between the two salesmen.
<table>
<tr><td></td><td>A</td><td>B</td></tr>
<tr><td>No of Sales</td><td>10</td><td>18</td></tr>
<tr><td>Yarn B</td><td>170</td><td>205</td></tr>
<tr><td>Standard deviation</td><td>20</td><td>25</td></tr>
</table></td><td>06</td><td>2</td><td>2</td><td>1.1.3</td></tr>
<tr><td>QIV c)</td><td>Compute spearman's rank coorelation coefficient for the following data</td><td>08</td><td>1</td><td></td><td>2.3.1</td></tr>
</table>

ENDSEM- EXAMINATION (DSY) JUNE-2022

	X	10	12	18	18	15	40
	Y	12	18	25	25	50	25

QV a)	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones: X: 0 1 2 3 4 5 f: 2 14 20 34 22 8	10	1	1	2.3.1
QV b)	In an experiment on immunization of cattle from tuberculosis the following results were obtained. Inoculated: Affected 267, Not affected 27 Not Inoculated: Affected 757, Not affected 155 Use Chi square test to determine the efficacy of vaccine in preventing tuberculosis.	10	3	2	1.1.1
QVI a)	10 workers are selected at random from a large number of workers in a factory, the no of items produced by them on a certain day are found to be 51, 52, 53, 55, 56, 57, 58, 59, 59, 60. In the light of this data, would it be appropriate to suggest that the mean of the number of items produced in the population is 58?	10	2	1	1.1.3
QVI b)	A die is thrown 264 times with the following results No appeared on die: 1 2 3 4 5 6 Frequency: 40 32 28 50 54 60 Show that the die is biased	10	1	3	2.1.3
QVI I a)	Fit a Poisson distribution for the following distribution X: 0 1 2 3 4 f: 123 59 14 3 1	10	3	3	2.1.4
QVI I b)	The local authorities in a certain city installed 10,000 electric lamps in the streets of the city.If these lamps have average life of 1000 burning hours with a standard deviation of 200 hours, what number of lamps might be expected to fail i) in first 800 hours ii) between 800 & 1200 hours?	10	3	2	1.1.3

Percentage Points of t - distribution



Example

For $\Phi = 10$ d. o. f.

$P(|t| > 1.812) = 0.1$

Φ \ P	0.20	0.10	0.05	0.02	0.01
1	3.078	6.314	12.706	31.612	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.641
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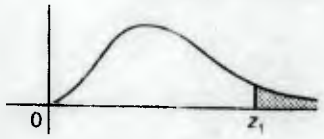
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.287
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.325	2.576

Percentage Points of χ^2 - Distribution



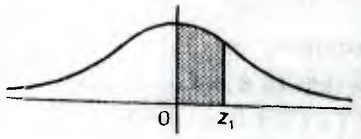
Example

For $\Phi = 10$ d. o. f.

$P(\chi^2 > 15.99) = 0.10$

Φ \ P	0 = .99	0.95	0.50	0.10	0.05	0.02	0.01
1	.000157	.00393	.455	2.706	3.841	5.214	6.635
2	.0201	.103	1.386	4.605	5.991	7.824	9.210
3	.115	.352	2.366	6.251	7.815	9.837	11.341
4	.297	.711	3.357	7.779	9.488	11.668	13.277
5	.554	1.145	4.351	9.236	11.070	13.388	15.086
6	.872	1.635	5.348	10.645	12.592	15.033	16.812
7	1.339	2.167	6.346	12.017	14.067	16.622	18.475
8	1.646	2.733	7.344	13.362	15.507	18.168	20.090
9	2.088	3.325	8.343	14.684	16.919	19.679	21.666
10	2.558	3.940	9.340	15.987	18.307	21.161	23.209
11	3.053	4.575	10.341	17.275	19.675	22.618	24.725
12	3.571	5.226	11.340	18.549	21.026	24.054	26.217
13	4.107	5.892	12.340	19.812	22.362	25.472	27.688
14	4.660	6.571	13.339	21.064	23.685	26.873	29.141
15	4.229	7.261	14.339	22.307	24.996	28.259	30.578
16	5.812	7.962	15.338	23.542	26.296	29.633	32.000
17	6.408	8.672	16.338	24.769	27.587	30.995	33.409
18	7.015	9.390	17.338	25.989	28.869	32.346	34.805
19	7.633	10.117	18.338	27.204	30.144	33.687	36.191
20	8.260	10.851	19.337	28.412	31.410	35.020	37.566
21	8.897	11.591	20.337	29.615	32.671	36.349	38.932
22	9.542	12.338	21.337	30.813	33.924	37.659	40.289
23	10.196	13.091	22.337	32.007	35.172	38.968	41.638
24	10.856	13.848	23.337	32.196	36.415	40.270	42.980
25	11.524	14.611	24.337	34.382	37.652	41.566	44.314
26	12.198	15.379	25.336	35.363	38.885	41.856	45.642
27	12.879	16.151	26.336	36.741	40.113	44.140	46.963
28	13.565	16.928	27.336	37.916	41.337	45.419	48.278
29	14.256	17.708	28.336	39.087	42.557	46.693	49.588
30	14.953	18.493	29.336	40.256	43.773	47.962	50.892

Area Under Standard Normal Curve



The table gives the area under the standard normal curve from $z = 0$ to $z = z_1$ which is the probability that z will lie between $z = 0$ and $z = z_1$

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.8832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4415	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4884	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4841	.4864	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4560	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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27/5/22

ENDSEM- EXAMINATION MAY-2022

Program: CIVIL S.Y.B.Tech (Civil) Sem IV **Duration: 03 Hours**

Course Code: BS-BTC401 **Maximum Points: 100**

Course Name: PROBABILITY & STATISTICS **Semester: IV**

- **Attempt any five out of seven questions**
- **Use of scientific non-programmable calculator is allowed.**

QN O.	QUESTION	PO INTS	CO	BL	PI
QI a)	The ratio of the probability of 3 successes in 5 independent trials to the probability of 2 successes in 5 independent trials is ¼. What is the probability of 4 successes in 6 independent trials?	10	1	2	2.1.3
QI b)	Given below is the probability distribution of a drv x with mean=16 then find 'a' & 'b' and variance of x x: 8, 12, 16, 20, 24 P(x): 1/8, a, b, 1/4, 1/12	10	3	1	1.1.2
QII a)	If the actual amount of coffee which a filling machine puts into 6 ounce jars is a random variable having normal distribution with standard deviation 0.05 ounce and if only 3% of the jars are to contain less than 6 ounce of coffee what must be the mean fill of these jars?	10	1	2	2.1.4
QII b)	In an examination marks obtained by students in mathematics, physics and chemistry are normally distributed with means 51,53 and 46 with standard deviations 15,12,16 respectively. Find the probability of securing total marks (i) 180 or more (ii) 90 or below	10	2	2	2.3.1
QIII a)	Five defective bulbs are accidently mixed with twenty good once. It is not possible to just look at the bulb and tell whether or not it is defective. Find the probability distribution of the number of defective bulbs, if four bulbs are drawn out at random from	10	3	2	1.1.2

ENDSEM- EXAMINATION MAY-2022

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<tr><td>QIV a)</td><td>Suppose that a local appliances shop has found from experience that the demand for tube lights roughly distributed as Poisson with a mean of 4 tubes per week. If the shop keeps 6 tubelights during a particular week. What is the probability that the demand will exceed the supply during that week?</td><td>10</td><td>1</td><td>3</td><td>2.3.1</td></tr>
<tr><td>QIV b)</td><td>Prices of shares of a company on different days in a month were found to be 66, 65, 69, 70, 69, 71, 70, 63, 64 and 68.
Discuss whether the price of shares to be 65.</td><td>10</td><td>2</td><td>2</td><td>1.1.3</td></tr>
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<tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>f</td><td>2</td><td>14</td><td>20</td><td>34</td><td>22</td><td>8</td></tr>
</table></td><td>10</td><td>1</td><td>1</td><td>2.3.1</td></tr>
<tr><td>QV b)</td><td>Investigate the association between the darkness of eyecolour in father and son from the following data
Colour of father's eyes
<table>
<tr><td></td><td>Dark</td><td>Not Dark</td></tr>
<tr><td>Dark(Son)</td><td>48</td><td>90</td></tr>
<tr><td>Not Dark(Son)</td><td>80</td><td>782</td></tr>
<tr><td>Total</td><td>128</td><td>872</td></tr>
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</table>

ENDSEM- EXAMINATION MAY-2022

<table>
<tr><td>QVI a)</td><td>For a random sample of 10 pigs fed diet A, the increases in weight in pounds in a certain period were 10, 6, 16, 17, 13, 12, 8, 14, 15, 9. For another random sample of 12 pigs, fed on diet B, the increase in the same period were 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17. Test whether the diets A & B differ significantly as regards their effect on increase in weight</td><td>10</td><td>2</td><td>1</td><td>1.1.3</td></tr>
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<tr><td>Frequency</td><td>40</td><td>32</td><td>28</td><td>50</td><td>54</td><td>60</td></tr>
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Show that the die is biased</td><td>10</td><td>1</td><td>3</td><td>2.1.3</td></tr>
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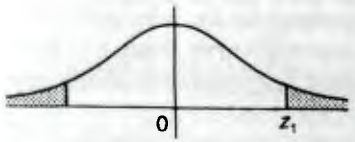
<table>
<tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>f</td><td>142</td><td>156</td><td>69</td><td>27</td><td>5</td><td>1</td></tr>
</table></td><td>10</td><td>3</td><td>3</td><td>2.1.4</td></tr>
<tr><td>QVI I b)</td><td>In an examination it is laid down that a student passes if he secures 30% or more marks. He is placed in Ist,IInd or IIIrd division according as he secures 60% or more marks, between 45% & 60% and between 30% & 45% respectively. He gets distinction in case he secures 80% or more marks. It is noticed from the result that 10% of the students failed in the examination where as 5% of them obtained distinction. Calculate the percentage of students placed in the second division.</td><td>10</td><td>3</td><td>2</td><td>1.1.3</td></tr>
</table>

Percentage Points of t - distribution



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10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.716	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.896
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.645
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.287
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.356	2.617
∞	1.282	1.645	1.960	2.325	2.576

Percentage Points of χ^2 - Distribution

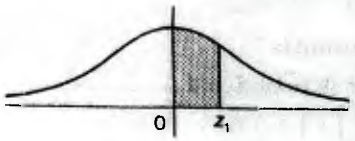
Example

For $\Phi = 10$ d. o. f.

$P(\chi^2 > 15.99) = 0.10$

Φ \ P	0 = .99	0.95	0.50	0.10	0.05	0.02	0.01
1	000157	.00393	.455	2.706	3.841	5.214	6.635
2	.0201	.103	1.386	4.605	5.991	7.824	9.210
3	.115	.352	2.366	6.251	7.815	9.837	11.341
4	.297	711	3.357	7.779	9.488	11.668	13.277
5	554	1.145	4.351	9.236	11.070	13.388	15.086
6	.872	1.635	5.348	10.645	12.592	15.033	16.812
7	1 339	2.167	6.346	12.017	14.067	16.622	18.475
8	1 646	2 733	7.344	13.362	15.507	18.168	20.090
9	2 088	3.325	8.343	14.684	16.919	19.679	21.666
10	2 558	3.940	9.340	15.987	18.307	21.161	23.209
11	3 053	4 575	10.341	17.275	19.675	22.618	24.725
12	3 571	5.226	11.340	18.549	21.026	24.054	26.217
13	4.107	5 892	12.340	19.812	22.362	25.472	27.688
14	4 660	6.571	13.339	21.064	23.685	26.873	29.141
15	4.229	7 261	14.339	22.307	24.996	28.259	30.578
16	5.812	7 962	15.338	23.542	26.296	29.633	32 000
17	6.408	6.672	16.338	24.769	27.587	30.995	33.409
18	7.015	9.390	17.338	25.989	28.869	32.346	34.805
19	7 633	10 117	18.338	27.204	30.144	33.687	36.191
20	8.260	10 851	19.337	28.412	31.410	35 020	37 566
21	8.897	11 591	20.337	29.615	32.671	36.349	38.932
22	9 542	12 338	21.337	30.813	33.924	37.659	40.289
23	10.196	13.091	22.337	32.007	35 172	38.968	41.638
24	10.856	13.848	23.337	32 196	36.415	40.270	42 980
25	11.524	14.611	24.337	34.382	37.652	41.566	44.314
26	12.198	15.379	25.336	35.363	38.885	41.856	45.642
27	12.879	16 151	26.336	36.741	40.113	44.140	46.963
28	13.565	16.928	27.336	37.916	41.337	45.419	48.278
29	14.256	17.708	28.336	39.087	42.557	46.693	49.588
30	14.953	18 493	29.336	40.256	43.773	47.962	50.892

Area Under Standard Normal Curve



The table gives the area under the standard normal curve from $z = 0$ to $z = z_1$ which is the probability that z will lie between $z = 0$ and $z = z_1$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.8832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	1808	.1844	1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4415	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4841	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	4952
2.6	.4953	.4955	.4956	.4957	.4959	.4560	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	4990

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

ENDSEM- REEXAMINATION JULY-2022

Program: CIVIL S. Y. B. Tech (Civil) Sem IV **Duration: 03 Hours**

Course Code: BS-BTC401 **Maximum Points: 100**

Course Name: PROBABILITY & STATISTICS **Semester: IV**

12/7/22.

- **Attempt any five out of seven questions**
- **Use of scientific non-programmable calculator is allowed.**

QNO.	QUESTION	POINTS	CO	BL	PI
QI a)	If the mean of a binomial distribution is 3 and the variance is $3/2$, find the probability of obtaining atleast 4 success.	06	1	2	2.1.3
QI b)	Given below is the probability distribution of a drv x with mean=16 then find 'a' & 'b' and variance of x x: 8, 12, 16, 20, 24 P(x): 1/8, a, b, 1/4, 1/12	06	3	1	1.1.2
QIc)	Show that the correlation coefficient r lies between -1 and 1.	08	1	2	2.3.1
QII a)	The mean weight of 500 male students at a certain college is 151 lb and standard deviation is 15 lb. Assuming that the weights are normally distributed, find how money students weigh i) Between 120 & 155 lb ii) More than 185 lb	10	1	2	2.1.4
QII b)	In an examination marks obtained by students in mathematics, physics and chemistry are normally distributed with means 51,53 and 46 with standard deviations 15,12,16 respectively. Find the probability of securing total marks (i) 180 or more (ii) 90 or below	10	2	2	2.3.1
QIII a)	Two bad eggs are mixed accidently with 10 good ones. Find the probability distribution of the number of bad eggs in 3, drawn at random, without replacement from this lot.	10	3	2	1.1.2
QIII	The sales-data of an article in six shops before and after a special promotional campaign are as under	10	1	2	1.1.1

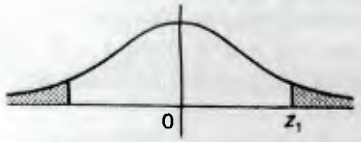
ENDSEM- REEXAMINATION JULY-2022

b)	Shops: A 53 / 58; B 28 / 29; C 31 / 30; D 48 / 55; E 50 / 56; F 42 / 45 (Before / After Campaign) Can the campaign be judged to be a success at 5% LOS.					
QIV a)	The probability that a smoker aged 25 years will die before reaching the age of 30 years may be taken a 0.018. Out of a group of 400 smokers, now aged 25 years, what is the probability that 2 smokers will die within the next 5 years?	06	1	3	2.3.1
QIV b)	Prices of shares of a company on different days in a month were found to be 66, 65, 69, 70, 69, 71, 70, 63, 64 and 68. Discuss whether the price of shares to be 65.	06	2	2	1.1.3
QIV c)	Compute spearman's rank coorelation coefficient for the following data X: 10, 12, 18, 18, 15, 40 Y: 12, 18, 25, 25, 50, 25	08	1	2	2.3.1
QV a)	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones: X: 0, 1, 2, 3, 4, 5 f: 2, 14, 20, 34, 22, 8	10	1	1	2.3.1
QV b)	Investigate the association between the darkness of eyecolour in father and son from the following data Colour of father's eyes Dark(Son): Dark 48, Not Dark 90 Not Dark(Son): Dark 80, Not Dark 782 Total: Dark 128, Not Dark 872	10	3	2	1.1.1
QVI a)	The mean life of sample of 10 electric light bulbs was found to the 456 hours with standard deviation of 423 hours. A second sample of 17 bulbs chosen from a different batch showed by	06	2	1	1.1.3

ENDSEM- REEXAMINATION JULY-2022

<table>
<tr><td></td><td>mean life of 1280 hours with standard deviation of 398 hours. Is there a significant difference between the mean of two batches?</td><td></td><td></td><td></td><td></td></tr>
<tr><td>QVI b)</td><td>A die is thrown 264 times with the following results
<table>
<tr><td>No appeared on die</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Frequency</td><td>40</td><td>32</td><td>28</td><td>50</td><td>54</td><td>60</td></tr>
</table>
Show that the die is biased</td><td>06</td><td>1</td><td>3</td><td>2.1.3</td></tr>
<tr><td>QVI c)</td><td>Calculate Karl Pearson's coefficient of correlation for the following data:
<table>
<tr><td>X</td><td>78</td><td>89</td><td>99</td><td>60</td><td>59</td><td>79</td></tr>
<tr><td>Y</td><td>125</td><td>137</td><td>156</td><td>112</td><td>107</td><td>136</td></tr>
</table></td><td>08</td><td>3</td><td>3</td><td>2.3.1</td></tr>
<tr><td>QVI I a)</td><td>Fit a poisson distribution for the following data and also test the goodness of fit
<table>
<tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>f</td><td>142</td><td>156</td><td>69</td><td>27</td><td>5</td><td>1</td></tr>
</table></td><td>10</td><td>3</td><td>3</td><td>2.1.4</td></tr>
<tr><td>QVI I b)</td><td>In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible:
Variance of X = 9
Regression equations: $8x-10y+66=0$
$40x-18y=214$
What are
i. Mean, value of x and y
ii. Standard deviation of y.
iii. Coefficient of correlation between x and y</td><td>10</td><td>3</td><td>2</td><td>1.1.3</td></tr>
</table>

Percentage Points of t - distribution



Example

For $\Phi = 10$ d. o. f.

$P(|t| > 1.812) = 0.1$

Φ \ P	0.20	0.10	0.05	0.02	0.01
1	3.078	6.314	12.706	31.812	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
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Percentage Points of χ^2 - Distribution

Example

For $\Phi = 10$ d. o. f.

$P(\chi^2 > 15.99) = 0.10$

Φ \ P	0 = .99	0.95	0.50	0.10	0.05	0.02	0.01
1	000157	.00393	.455	2.706	3.841	5.214	6.635
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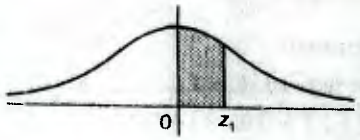
4	.297	.711	3.357	7.779	9.488	11.668	13.277
5	.554	1.145	4.351	9.236	11.070	13.388	15.086
6	.872	1.635	5.348	10.645	12.592	15.033	16.812
7	1.339	2.167	6.346	12.017	14.067	16.622	18.475
8	1.646	2.733	7.344	13.362	15.507	18.168	20.090
9	2.088	3.325	8.343	14.684	16.919	19.679	21.666
10	2.558	3.940	9.340	15.987	18.307	21.161	23.209
11	3.053	4.575	10.341	17.275	19.675	22.618	24.725
12	3.571	5.226	11.340	18.549	21.026	24.054	26.217
13	4.107	5.892	12.340	19.812	22.362	25.472	27.688
14	4.660	6.571	13.339	21.064	23.685	26.873	29.141
15	4.229	7.261	14.339	22.307	24.996	28.259	30.578
16	5.812	7.962	15.338	23.542	26.296	29.633	32.000
17	6.408	8.672	16.338	24.769	27.587	30.995	33.409
18	7.015	9.390	17.338	25.989	28.869	32.346	34.805
19	7.633	10.117	18.338	27.204	30.144	33.687	36.191
20	8.260	10.851	19.337	28.412	31.410	35.020	37.566
21	8.897	11.591	20.337	29.615	32.671	36.349	38.932
22	9.542	12.338	21.337	30.813	33.924	37.659	40.289
23	10.196	13.091	22.337	32.007	35.172	38.968	41.638
24	10.856	13.848	23.337	32.196	36.415	40.270	42 980
25	11.524	14.611	24.337	34.382	37.652	41.566	44.314
26	12.198	15.379	25.336	35.363	38.885	41.858	45.642
27	12.879	16.151	26.336	36.741	40.113	44.140	46.963
28	13.585	16.928	27.336	37.916	41.337	45.419	48.278
29	14.256	17.708	28.336	39.087	42.557	46.893	49.588
30	14.953	18 493	29.336	40.258	43.773	47.962	50.892

Area Under Standard Normal Curve



The table gives the area under the standard normal curve from $z = 0$ to $z = z_1$ which is the probability that z will lie between $z = 0$ and $z = z_1$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.8832	.0871	.0910	.0948	.0987	.1026	.1084	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3685	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4238	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4415	.4525	.4535	.4545
1.7	.4554	.4584	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4864	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4888	.4871	.4875	.4878	.4841	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4560	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058.

D.S.A. (AY 2021-22), End Semester Examinations, July 2022

D.S.Y.B.Tech (Civil) Sem IV

Program: B.Tech. Civil Engineering
Course Code : **PC-BTC403**
Course Name : **Concrete Technology**

Duration: 3 Hour
Maximum points: 100
Semester: IV

8/7/22

Instructions:

1. Attempt ***any FIVE questions out of SEVEN*** questions
2. Answers to all sub questions should be grouped together
3. Draw neat diagrams wherever required
4. Assume suitable data if necessary and state the clearly.

Que. No.	Descriptions	Points	CO	BL	PI
Q1	**(a)** What are the different types of Grades of cement? Enlist different types of cement and explain any four in short.	10	3	2	1.2.1
	(b) How you will measure the corrosion of reinforcement in concrete?	4	3	4	2.1.2
	(c) State the benefits of RMC over conventional concreting.	6	1	2	1.2.1
Q2	**a.** How you will evaluate the suitability of cement based on physical properties?	10	1	3	2.3.1
	b. Following data refers to the sieve analysis of sand. Find the Fineness modulus and Grading Zone in the tabular format (Refer guidelines as per IS 383 given below.)	6	1	3	1.3.2

Sieve size	*10 mm*	*4.75 mm*	*2.36 mm*	*1.18 mm*	*600 micron*	*300 micron*	*150 micron*	*pan*
weight retained in gm.	*00*	*12*	*22*	*170*	*396*	*215*	*165*	*20*

IS Sieve Designation	Percentage Passing for			
	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
10 mm	100	100	100	100
4·75 mm	90-100	90-100	90-100	95-100
2·36 mm	60-95	75-100	85-100	95-100
1·18 mm	30-70	55-90	75-100	90-100
600 micron	15-34	35-59	60-79	80-100
300 micron	5-20	8-30	12-40	15-50
150 micron	0-10	0-10	0-10	0-15

c. Distinguish between Light weight and High density concrete	4	2	2	2.3.1

Q3	a. Design reinforced cement concrete of M35 grade using guidelines given in IS 10262:2019 for the following data.				15	2	2	2.3.1
	Exposure condition: Moderate	Maximum size of aggregate —20 mm	Method of placement — Chute	Specific gravity of 20 mm aggregate — 2.70				
	Strength of cement OPC —53 MPa	Workability — slump, 80 mm	Type of coarse aggregate — angular coarse aggregate	Specific gravity of 10 mm aggregate — 2.70				
	Refer data of Que. 2b, for Zone of sand	Total moisture content in 20, 10 mm -- 0.5%	Total moisture content in fine aggregate — 3.0 %	Specific gravity of fine aggregate — 2.65				
	(b) What you know about Silica fumes? How it helps to Improve performance of concrete?				5	3	4	2.1.2
Q4	**(a)** Design concrete of M35 grade using ACI Method; consider the data related to the properties of material as given in Que.No.3a.				10	2	3	1.3.1
	(b) Discuss advantages of fiber reinforced concrete over ordinary concrete.				6	1	2	2.3.1
	(c) Explain the procedure of measuring workability using flow table test.				4	2	3	1.2.1
Q5	**(a)** Explain the mechanism of retardation using admixture in detail.				8	1	2	2.1.2
	(b) Describe the procedure for measuring pH of concrete? Highlight the importance of the same from durability point of view.				6	1	3	1.3.1
	(c) What is polymer concrete? Discuss various applications of the same.				6	2	2	2.3.1
Q6	(a) Discuss in detail process of batching for making concrete.				8	1	2	2.3.1
	(b) What do you meant by cold whether concrete?				6	3	3	1.3.2
	(c) What is NDT? Where it is required?				6	2	3	1.4.1
Q7	Write explanatory notes on the following (any Four)							
	i)	DOE method of mix design			5	3	2	1.3.1
	ii)	Low heat Cement			5	2	2	1.3.1
	iii)	Bulking of sand			5	3	2	1.3.1
	iv)	Accelerators in concrete			5	1	2	1.3.1
	v)	Workability and Durability			5	1	2	1.3.1
	vi)	high performance concrete			5	3	2	1.3.1

Table 1,2 and 3 for ACI Method Concrete Mix Design

(1) Dry Bulk Volume of coarse aggregate/ unit volume of concrete as per ACI 211.1-91

Maximum size of aggregate	Bulk volume of dry rodded CA /unit volume of concrete for fineness modulus of sand of			
FM	2.4	2.6	2.8	3.00
10	0.5	0.48	0.46	0.44
12.5.	0.59	0.57	0.55	0.53
20 (25,40,50,70)	0.66	0.64	0.62	0.60
150	.87	0.85	0.83	0.81

(2) Relation between water/cement ratio & average compressive strength of concrete, as per ACI211.1-91

Average compressive strength at 28 days	Effective water/cement ratio (by mass)	
MPa	Non air entrained concrete	Air entrained concrete
45	0.38	-
40	0.43	-
35 (30,25,20)	0.48	0.4
15	0.8	0.71

(3) Requirements of ACI-318-89 for w/c ratio & strength for special exposure conditions

Exposure condition	Maximum w/c ratio, normal density aggregate concrete	Minimum design strength. low density aggregate concrete MPa
Concrete intended to be watertight		
(a) Exposed to fresh water	0.5	25
(b) Exposed to sea water	0.45	30
Concrete exposed to freezing in a moist condition	0.45	30
For corrosion protection of reinforced concrete exposed to de icing salts, sea water	0.4	33

Table 4,5 and 6 for ACI Method Concrete Mix Design

(4) Recommended value of slump for various types of construction as per ACI 211.1-91

Type of construction	Range of slump (mm)
Reinforces foundation walls & footings	20-80
Plain footings,substructure wall	20-80
Beams & reinforced walls	20-100
Building columns	20-100
Pavements & slabs	20-80
Mass concrete	20-80

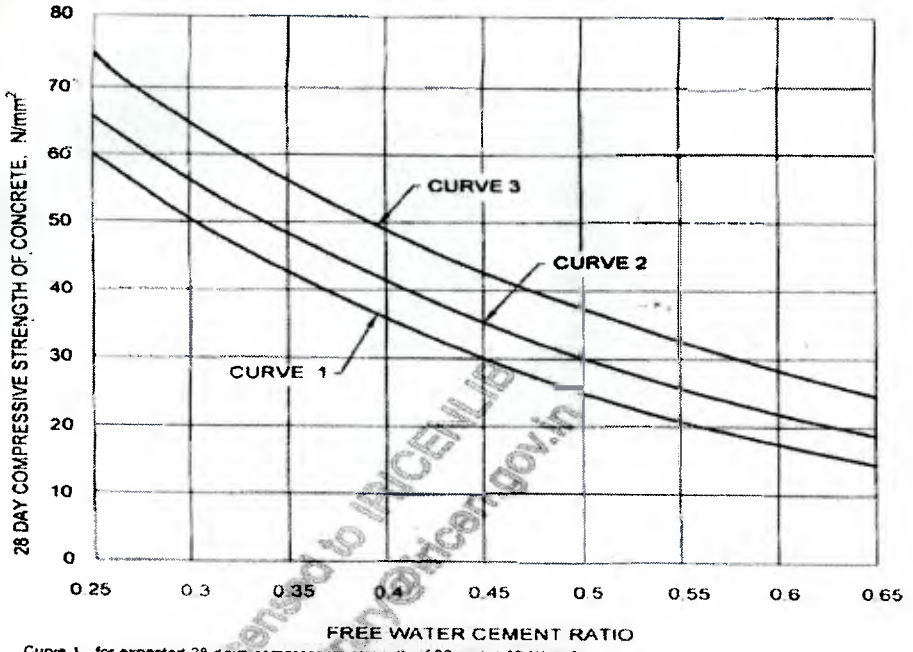
(5) Approximate requirements for mixing water & air content for different workabilities & nominal maximum size of aggregates as per ACI211.1-91

Non air entrained concrete				
Workability or air content (Slump)	Water content, kg/m3 of concrete for indicted maximum aggregate size			
	10 mm (25, 40,50,70)	12.5 mm	20 mm	150 mm
30 -50 mm	205	200	185	125
80-100 mm	225	215	200	140
150-180 mm	240	230	210	-
Approx entrapped air (%)	3	2.5	2	0.2

(6) First estimate of density of fresh concrete as per ACI 211.1-91

Maximum size of aggregate (mm)	First estimate of density of fresh concrete	
	Non air entrained kg/m	Air entrained kg/m³
10	2285	2190
12.5 (20,25,40,50)	2315	2235
20	2355	2280
150	2505	2435

Reference Tables for IS 10262:2019 Method of Concrete mix design



Curve 1 for expected 28 days compressive strength of 33 and < 43 N/mm²
Curve 2 for expected 28 days compressive strength of 43 and < 53 N/mm²
Curve 3 for expected 28 days compressive strength of 53 N/mm² and above

NOTES

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 *and* 9.1.2*)*

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	-	300	0.55	M 20
ii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

IS 10262 : 2019

Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50

(Clause 5.5*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.54	0.52	0.50	0.48
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.73	0.72	0.71	0.69

NOTES

1 Volumes are based on aggregates in saturated surface dry condition.

2 These volumes are for crushed (angular) aggregate and suitable adjustments may be made for other shape of aggregate.

3 Suitable adjustments may also be made for fine aggregate from other than natural sources, normally, crushed sand or mixed sand may need lesser fine aggregate content. In that case, the coarse aggregate volume shall be suitably increased.

4 It is recommended that fine aggregate conforming to Grading Zone IV, as per IS 383 shall not be used in reinforced concrete unless tests have been made to ascertain the suitability of proposed mix proportions.

Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate

(Clause 5.3*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Water Content[b] kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

[b] Water content corresponding to saturated surface dry aggregate.

Table 3 Approximate Air Content

(Clause 5.2*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Entrapped Air, as Percentage of Volume of Concrete
(1)	(2)	(3)
i)	10	1.5
ii)	20	1.0
iii)	40	0.8

5.2.1 The actual values of air content can also adopted during mix proportioning, if the site data least 5 results) for similar mix is available.

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End Semester Examinations, May 2022

S.Y. B.Tech (Civil) Sem IV 21/5/22

Program: B.Tech. Civil Engineering
Course Code : **PC-BTC403**
Course Name : **Concrete Technology**

Duration: 3 Hour
Maximum points: 100
Semester: IV

Instructions:

1. Attempt ***any FIVE questions out of SEVEN*** questions
2. Answers to all sub questions should be grouped together
3. Draw neat diagrams wherever required
4. Assume suitable data if necessary and state the clearly.

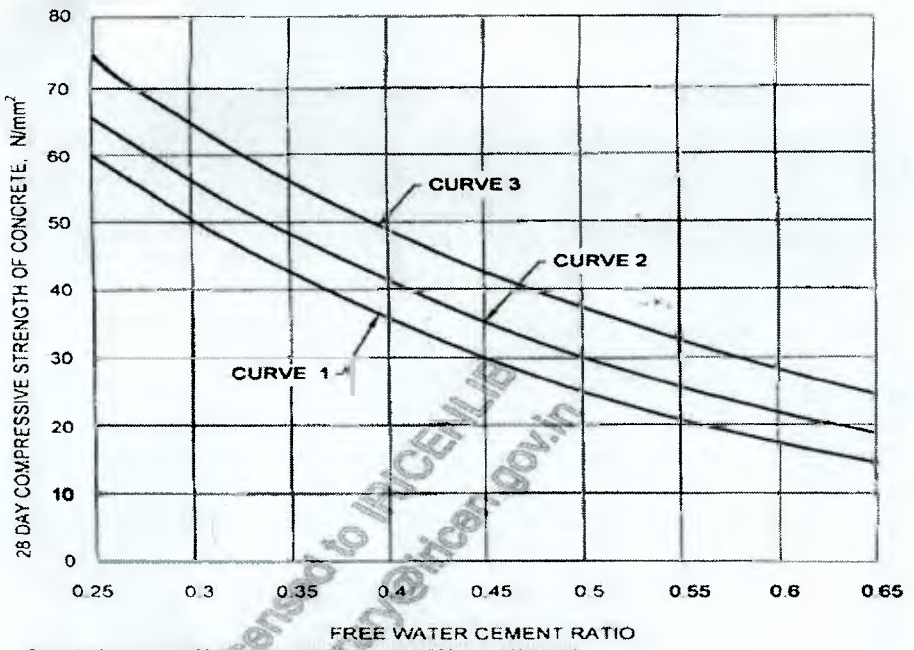
Que. No.	Descriptions	Points	CO	BL	PI
Q1	**(a)** Draw the layout of RMC plant. Explain different functional units of batching plant and their utility.	10	3	2	1.2.1
	(b) What do you mean by carbonation of concrete? Discuss the various factors that affect the rate of carbonation.	5	3	4	2.1.2
	(c) State the advantages of super plasticizers.	5	1	2	1.2.1
Q2	**a.** What are mineral admixtures? Name four mineral admixtures and their sources.	5	1	3	1.3.2
	b. Design concrete for M30 grade using guidelines given in IS 10262:2019 for the following data.	15	2	2	2.3.1

Exposure condition: Moderate	Maximum size of aggregate —20 mm	Method of placement — Chute	Specific gravity of 20 mm aggregate — 2.72
Strength of cement OPC —50 MPa	Workability — slump, 50 mm	Type of coarse aggregate — angular coarse aggregate	Specific gravity of 10 mm aggregate — 2.71
Zone of sand — II	Total moisture content in 20, 10 mm -- 0.3%	Total moisture content in fine aggregate — 2.5 %	Specific gravity of fine aggregate — 2.62

Q3	**(a)** What is High Performance concrete (HPC)? Discuss the various characteristics of HPC.	10	3	4	2.1.2
	(b) What you know about non-destructive testing of concrete? Explain in detail the procedure for conducting UPV and Rebound hammer test.	10	2	2	2.4.2
Q4	**(a)** Design concrete for M30 grade using ACI Method; consider the data related to the properties of material as given in Que.No.2.	10	2	3	1.3.1
	(b) What is fiber reinforced concrete? How it is different than ordinary concrete?	6	1	2	2.3.1
	(c) Differentiate between mineral and chemical admixtures.	4	2	3	1.2.1

Q5	**(a)** What is underwater concreting? Explain Tremie method in detail. **(b)** How light weight concrete is manufactured? **(c)** Highlight the salient features of Road Note No.4 method.	10 5 5	1 1 2	2 3 2	2.1.2 1.3.1 2.3.1
Q6	(a) Enlist the various stages of concrete production and discuss compaction of concrete in detail. (b) What is Polymer concrete? State the applications of the same. (c) How GGBS improve the performance of concrete?	**10** **5** **5**	1 3 2	2 3 3	2.3.1 1.3.2 1.4.1
Q7	Write explanatory notes on the following (any Four) i) Hot weather concrete ii) Sulphate Resisting Cement iii) Transit Mixer iv) size and shape of aggregates v) Durability of Concrete vi) Retarders	 5 5 5 5 5 5	 3 2 3 1 1 3	 2 2 2 2 2 2	 1.3.1 1.3.1 1.3.1 1.3.1 1.3.1 1.3.1

Reference Tables for IS 10262:2019 Method of Concrete mix design



Curve 1 — for expected 28 days compressive strength of 33 and < 43 N/mm².
Curve 2 — for expected 28 days compressive strength of 43 and < 53 N/mm².
Curve 3 — for expected 28 days compressive strength of 53 N/mm² and above.

NOTES

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 *and* 9.1.2*)*

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	–	300	0.55	M 20
iii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

IS 10262 : 2019

Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50

(Clause 5.5*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.54	0.52	0.50	0.48
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.73	0.72	0.71	0.69

NOTES

1 Volumes are based on aggregates in saturated surface dry condition.

2 These volumes are for crushed (angular) aggregate and suitable adjustments may be made for other shape of aggregate.

3 Suitable adjustments may also be made for fine aggregate from other than natural sources. normally, crushed sand or mixed sand may need lesser fine aggregate content. In that case. the coarse aggregate volume shall be suitably increased.

4 *It* is recommended that fine aggregate conforming to Grading Zone IV, as per IS 383 shall not be used in reinforced concrete unless tests have been made to ascertain the suitability of proposed mix proportions.

Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate

(Clause 5.3*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Water Content[1] kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

[1]Water content corresponding to saturated surface dry aggregate.

Table 3 Approximate Air Content

(Clause 5.2*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Entrapped Air, as Percentage of Volume of Concrete
(1)	(2)	(3)
i)	10	1.5
ii)	20	1.0
iii)	40	0.8

5.2.1 The actual values of air content can also adopted during mix proportioning, if the site data least 5 results) for similar mix is available.

Table 1,2 and 3 for ACI Method Concrete Mix Design

(1) Dry Bulk Volume of coarse aggregate/ unit volume of concrete as per ACI 211.1-91

Maximum size of aggregate	Bulk volume of dry rodded CA /unit volume of concrete for fineness modulus of sand of			
FM	2.4	2.6	2.8	3.00
10	0.5	0.48	0.46	0.44
12.5,	0.59	0.57	0.55	0.53
20 (25,40,50,70)	0.66	0.64	0.62	0.60
150	.87	0.85	0.83	0.81

(2) Relation between water/cement ratio & average compressive strength of concrete, as per ACI211.1-91

Average compressive strength at 28 days	Effective water/cement ratio (by mass)	
MPa	Non air entrained concrete	Air entrained concrete
45	0.38	-
40	0.43	-
35 (30,25,20)	0.48	0.4
15	0.8	0.71

(3) Requirements of ACI-318-89 for w/c ratio & strength for special exposure conditions

Exposure condition	Maximum w/c ratio, normal density aggregate concrete	Minimum design strength, low density aggregate concrete MPa
Concrete intended to be watertight		
(a) Exposed to fresh water	0.5	25
(b) Exposed to sea water	0.45	30
Concrete exposed to freezing in a moist condition	0.45	30
For corrosion protection of reinforced concrete exposed to de icing salts, sea water	0.4	33

Table 4,5 and 6 for ACI Method Concrete Mix Design

(4) Recommended value of slump for various types of construction as per ACI 211.1-91

Type of construction	Range of slump (mm)
Reinforces foundation walls & footings	20-80
Plain footings,substructure wall	20-80
Beams & reinforced walls	20-100
Building columns	20-100
Pavements & slabs	20-80
Mass concrete	20-80

(5) Approximate requirements for mixing water & air content for different workabilities & nominal maximum size of aggregates as per ACI211.1-91

Non air entrained concrete				
Workability or air content (Slump)	Water content, kg/m3 of concrete for indicted maximum aggregate size			
	10 mm (25. 40,50,70)	12.5 mm	20 mm	150 mm
30 -50 mm	205	200	185	125
80-100 mm	225	215	200	140
150-180 mm	240	230	210	-
Approx entrapped air (%)	3	2.5	2	0.2

(6) First estimate of density of fresh concrete as per ACI 211.1-91

Maximum size of aggregate (mm)	First estimate of density of fresh concrete	
	Non air entrained kg/m³	Air entrained kg/m³
10	2285	2190
12.5 (20,25,40,50)	2315	2235
20	2355	2280
150	2505	2435

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Re-examinations, July 2022

S. Y. B. Tech Civil Sem IV 13/7/22.

Program: B.Tech. Civil Engineering — Duration: 3 Hour

Course Code : **PC-BTC403** — Maximum points: 100

Course Name : **Concrete Technology** — Semester: IV

Instructions:

1. Attempt ***any FIVE questions out of SEVEN*** questions
2. Answers to all sub questions should be grouped together
3. Draw neat diagrams wherever required
4. Assume suitable data if necessary and state the clearly.

Que. No.	Descriptions	Points	CO	BL	PI
Q1	**(a)** How you will evaluate the suitability of cement based on physical properties?	10	3	2	1.2.1
	(b) How you will measure the pH of concrete?	5	3	4	2.1.2
	(c) Compare advantages of RMC over ordinary concrete.	5	1	2	1.2.1
Q2	**a.** Why segregation and bleeding occurs in concrete?	5	1	3	1.3.2
	b. Design concrete for M40 grade using guidelines given in IS 10262:2019 for the following data.	15	2	2	2.3.1

Exposure condition: Moderate	Maximum size of aggregate —20 mm	Method of placement — Chute	Specific gravity of 20 mm aggregate — 2.80
Strength of cement OPC —50 MPa	Workability — slump, 120 mm	Type of coarse aggregate — angular coarse aggregate	Specific gravity of 10 mm aggregate — 2.75
Zone of sand — I	Total moisture content in 20, 10 mm -- 0.5%	Total moisture content in fine aggregate — 2.60 %	Specific gravity of fine aggregate — 2.75

Q3	**(a)** What you know about the grades of cement? Explain Low heat, Rapid hardening and Hydrophobic cement in detail.	10	3	4	2.1.2
	(b) You are appointed as "site Engineer", explain the step by step procedure to be followed to complete the concreting activity.	10	2	2	2.4.2
Q4	**(a)** Design concrete for M40 grade using ACI Method; consider the data related to the properties of material as given in Que.No.2.	10	2	3	1.3.1
	(b) What properties will you take into account to find the suitability of coarse aggregate to make sound concrete?	10	1	2	2.3.1

Q5	**(a)** Explain in brief Light weight concrete, high density concrete and hot weather concrete.	10	1	2	2.1.2
	(b) Discuss the applications of fiber reinforced concrete.	5	1	3	1.3.1
	(c) What is retarder? Explain the need of the same in construction.	5	2	2	2.3.1
Q6	(a) Explain any three tests to be conducted on each fresh and hardened concrete.	**10**	1	2	2.3.1
	(b) What problem is faced during under water concreting?	**5**	3	3	1.3.2
	(c) How volcanic ash helps to improve the performance of concrete?	**5**	2	3	1.4.1
Q7	Write explanatory notes on the following (any Four)				
	i) Compaction factor test	5	3	2	1.3.1
	ii) Portland pozzolona cement	5	2	2	1.3.1
	iii) Silica fumes	5	3	2	1.3.1
	iv) Batching of concrete	5	1	2	1.3.1
	v) Durability	5	1	2	1.3.1
	vi) Polymer concrete	5	3	2	1.3.1

Table 1,2 and 3 for ACI Method Concrete Mix Design

(1) Dry Bulk Volume of coarse aggregate/ unit volume of concrete as per ACI 211.1-91

Maximum size of aggregate	Bulk volume of dry rodded CA /unit volume of concrete for fineness modulus of sand of			
FM	2.4	2.6	2.8	3.00
10	0.5	0.48	0.46	0.44
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20 (25,40,50,70)	0.66	0.64	0.62	0.60
150	.87	0.85	0.83	0.81

(2) Relation between water/cement ratio & average compressive strength of concrete, as per ACI211.1-91

Average compressive strength at 28 days	Effective water/cement ratio (by mass)	
MPa	Non air entrained concrete	Air entrained concrete
45	0.38	-
40	0.43	-
35 (30,25,20)	0.48	0.4
15	0.8	0.71

(3) Requirements of ACI-318-89 for w/c ratio & strength for special exposure conditions

Exposure condition	Maximum w/c ratio, normal density aggregate concrete	Minimum design strength, low density aggregate concrete MPa
Concrete intended to be watertight		
(a) Exposed to fresh water	0.5	25
(b) Exposed to sea water	0.45	30
Concrete exposed to freezing in a moist condition	0.45	30
For corrosion protection of reinforced concrete exposed to de icing salts, sea water	0.4	33

Table 4,5 and 6 for ACI Method Concrete Mix Design

(4) Recommended value of slump for various types of construction as per ACI 211.1-91

Type of construction	Range of slump (mm)
Reinforces foundation walls & footings	20-80
Plain footings,substructure wall	20-80
Beams & reinforced walls	20-100
Building columns	20-100
Pavements & slabs	20-80
Mass concrete	20-80

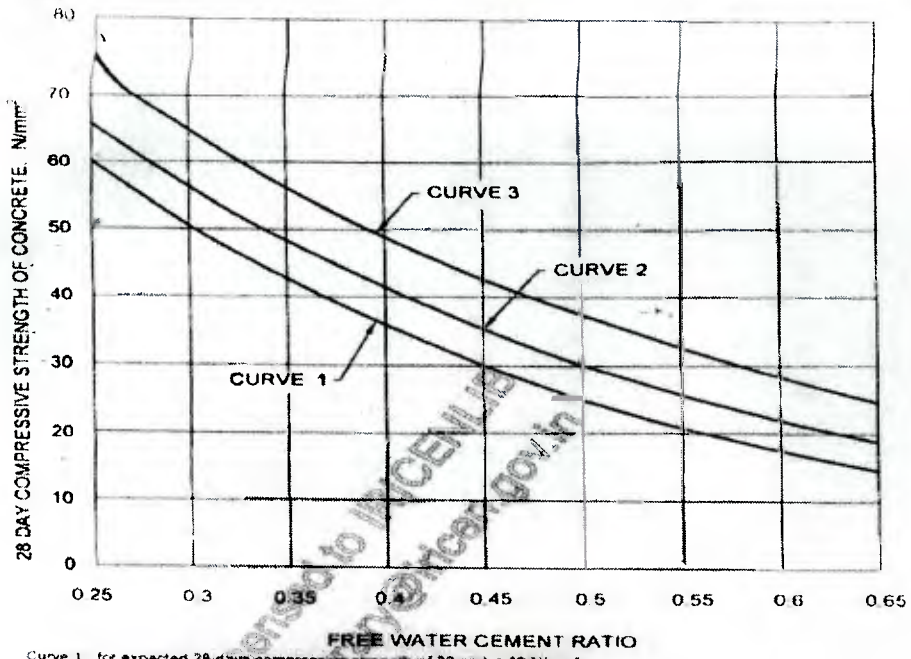
(5) Approximate requirements for mixing water & air content for different workabilities & nominal maximum size of aggregates as per ACI211.1-91

Non air entrained concrete				
Workability or Air content (Slump)	Water content kg/m3 of concrete for indicted maximum aggregate size			
	10 mm (25, 40,50,70)	12.5 mm	20 mm	150 mm
30 -50 mm	205	200	185	125
80-100 mm	225	215	200	140
150-180 mm	240	230	210	-
Approx entrapped air (%)	3	2.5	2	0.2

(6) First estimate of density of fresh concrete as per ACI 211.1-91

Maximum size of aggregate (mm)	First estimate of density of fresh concrete	
	Non air entrained kg/m	Air entrained kg/m
10	2285	2190
12.5 (20,25,40,50)	2315	2235
20	2355	2280
150	2505	2435

Reference Tables for IS 10262:2019 Method of Concrete mix design



Curve 1 for expected 28 days compressive strength of 33 and < 43 N/mm²
Curve 2 for expected 28 days compressive strength of 43 and < 53 N/mm².
Curve 3 for expected 28 days compressive strength of 53 N/mm² and above.

NOTES

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 *and* 9.1.2*)*

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	-	300	0.55	M 20
ii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

IS 10262 : 2019

Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50

(Clause 5.5*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.54	0.52	0.50	0.48
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.73	0.72	0.71	0.69

NOTES

1 Volumes are based on aggregates in saturated surface dry condition.

2 These volumes are for crushed (angular) aggregate and suitable adjustments may be made for other shape of aggregate.

3 Suitable adjustments may also be made for fine aggregate from other than natural sources, normally, crushed sand or mixed sand may need lesser fine aggregate content. In that case, the coarse aggregate volume shall be suitably increased.

4 It is recommended that fine aggregate conforming to Grading Zone IV, as per IS 383 shall not be used in reinforced concrete unless tests have been made to ascertain the suitability of proposed mix proportions.

Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate

(Clause 5.3*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Water Content[1] kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

[1] Water content corresponding to saturated surface dry aggregate.

Table 3 Approximate Air Content

(Clause 5.2*)*

Sl No.	Nominal Maximum Size of Aggregate mm	Entrapped Air, as Perrentage of Volume of Concrete
(1)	(2)	(3)
i)	10	1.5
ii)	20	1.0
iii)	40	0.8

5.2.1 The actual values of air content can also adopted during mix proportioning, if the site data least 5 results) for similar mix is available.

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DSY END SEMESTER EXAMINATION, JULY-2022

D.S.Y. B.Tech (Civil) Sem IV

Program: **B.Tech. in Civil Engineering-DSY** Date: **11 July 2022**
Class: **Second Year B.Tech. (Civil)** Duration: **3 Hr.**
Course code:**MC-BTC 002** Max. Points: **100**
Name of the Course: **Indian Traditional Knowledge** Semester: **IV** 18/7/22

Instructions: Solve **ANY FIVE** Questions with elaborative answers in legible handwriting.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	**a) Explain:** *'Concept and Rule of Dharma in India since ancient times'* with suitable examples.	**(10)**	1	II	6.1.1	1
	b) Justify: *"India is the unique country with unity in diversity as its core strength since ancient times"* giving suitable examples.	**(10)**	1	VI	6.1.1	1
Q.2	**a) Discuss** : Spiritual enrichment of ancient Indian tradition with suitable examples.	**(10)**	1	I,VI	6.1.1	2
	b) Justify: *"Nature is the supreme teacher (Guru)"* with characteristics of any 03 elements in nature for learnings of Adi yogi Shri Dattatreya.	**(10)**	1	VI	6.1.1	2
Q.3	**a) Explain:** With two examples the greatness of wisdom of ancient indian scholars in the field of mathematics and astronomy.	**(10)**	2	II	6.1.1	3
	b) Discuss: Advancement in the field of science and technology in ancient India.	**(10)**	2	V	6.1.1	3
Q.4	**a) Justify:** Advancements in medicinal and healthcare practices in ancient India.	**(10)**	2	VI	6.1.1	4
	b) **Justify:** *"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	**(10)**	2	VI	6.1.1	4
.Q.5	**a) List:** Names of various Indian classical dance forms and **Describe:** Any two of them with its significance.	**(10)**	3	I, V	6.1.1	5
	b) List: Various traditional art forms of ancient Indian and **Describe:** any one of them.	**(10)**	3	I, V	6.1.1	5
Q.6	**a) Explain:** Rich heritage of Indian Traditional Languages since ancient times and significance of any one language of India.	**(10)**	3	II	6.1.1	6
	b) Discuss: Significance and teachings of any one great epic / literature of ancient Indian tradition.	**(10)**	3	V	6.1.1	6
Q.7	**a) Discuss:** In brief, life, work, philosophy and contribution of Sant Dnyaneshwar Maharaj.	**(10)**	4	V	6.1.1	7
	b) Discuss: In brief, life, work and contribution of Chhatrapati Shri Shivaji Maharaj.	**(10)**	4	V	6.1.1	7

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END SEMESTER EXAMINATION, MAY-2022

Program: **B.Tech. in Civil Engineering**
Class: **Second Year B.Tech. (Civil)**
Course code:**MC-BTC 002**
Name of the Course: **Indian Traditional Knowledge**

Date:17May 2022
Duration: **3 Hr.**
Max. Points: **100**
Semester: **IV**

Instructions: Solve **ANY FIVE** Questions.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	**a) Explain:** *'Concept and Rule of Dharma in India since ancient times'* with suitable examples.	**(10)**	1	II	6.1.1	1
	b) Justify: *"India is the unique country with unity in diversity as its core strength since ancient times"* giving suitable examples.	**(10)**	1	VI	6.1.1	1
Q.2	**a) List:** Names of The Vedas and Upvedas. **Justify:***"Vedas are the eternal source of knowledge for the entire mankid".*	**(10)**	1	I,VI	6.1.1	2
	b) Justify: *"Nature is the supreme teacher (Guru)"* describing characteristics of any 03 elements in nature, learnings of Adi yogi Shri Dattatreya from these elements of nature.	**(10)**	1	VI	6.1.1	2
Q.3	**a) Explain:** With two examples the greatness of wisdom of ancient indian scholars in the field of mathematics and astronomy.	**(10)**	2	II	6.1.1	3
	b) Discuss: Superior Knowledge of ancient Indian sages explaining the valuable contribution of Maharshi Kanad.	**(10)**	2	V	6.1.1	3
Q.4	**a) Explain:** Any one significant medical practice and medical practitioner in ancient India.	**(10)**	2	II	6.1.1	4
	b) **Justify:***"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	**(10)**	2	VI	6.1.1	4
Q.5	**a) List:** Names of various Indian classical dance forms and **Describe:** Any two of them with its significance.	**(10)**	3	I, V	6.1.1	5
	b) List: Various traditional art forms of ancient Indian and **Describe:** any one of them.	**(10)**	3	I, V	6.1.1	5
Q.6	**a) Explain:** Rich heritage of Indian Traditional Languages since ancient times and significance of any one language of India.	**(10)**	3	II	6.1.1	6
	b) Discuss: Significance and teachings of any one great epic of ancient Indian tradition.	**(10)**	3	V	6.1.1	6
Q.7	**a) Discuss:** In brief, life, work, philosophy and contribution of Sant Dnyaneshwar Maharaj.	**(10)**	4	V	6.1.1	7
	b) Discuss: In brief, life, work, philosophy and teachings of Bhagwan Gautam Buddha for the entire mankind.	**(10)**	4	V	6.1.1	7

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RE-EXAMINATION, JULY-2022

S.Y. B.Tech Civil Sem IV

Program: **B.Tech. in Civil Engineering**
Class: **Second Year B.Tech. (Civil)**
Course code:**MC-BTE 002**
Name of the Course: **Indian Traditional Knowledge**

Date: **July 2022**
Duration: **3 Hr.**
Max. Points: **100**
Semester: **IV** 14/7/22

Instructions: Solve **ANY FIVE** Questions with elaborative answers in legible handwriting.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	a) **Explain:** *'Concept and Rule of Dharma in India since ancient times'* with suitable examples.	(10)	1	II	6.1.1	1
	b) **Justify:** *"India is the unique country with unity in diversity as its core strength since ancient times"* giving suitable examples.	(10)	1	VI	6.1.1	1
Q.2	a) **Discuss :** Spiritual enrichment of ancient Indian tradition with suitable examples.	(10)	1	I,VI	6.1.1	2
	b) **List:** Names of Principal Vedas and Upvedas. **Justify:** *"Vedas are the eternal source of knowledge for mankind since time in memory".*	(10)	1	I, VI	6.1.1	2
Q.3	a) **Explain:** With two examples the greatness of wisdom of ancient indian scholars in the field of mathematics and astronomy.	(10)	2	II	6.1.1	3
	b) **Discuss:** Advancement in the field of science and technology in ancient India.	(10)	2	V	6.1.1	3
Q.4	a) **Justify:** Advancements in medicinal and healthcare practices in ancient India.	(10)	2	VI	6.1.1	4
	b) **Justify:** *"Yoga is the key for long life with good health"* in context of ancient as well as modern India.	(10)	2	VI	6.1.1	4
Q.5	a) **List:** Names of various Indian classical dance forms and **Describe:** Any two of them with its significance.	(10)	3	I, V	6.1.1	5
	b) **List:** Various traditional art forms of ancient Indian and **Describe:** any one of them.	(10)	3	I, V	6.1.1	5
Q.6	a) **Explain:** Rich heritage of Indian Traditional Languages since ancient times and significance of any one language of India.	(10)	3	II	6.1.1	6
	b) **List: 03 Main epics / literature in Indian tradition. Discuss:** Significance and teachings of any one epic / literature.	(10)	3	V	6.1.1	6
Q.7	a) **Discuss:** In brief, life, work, philosophy and contribution of Sant Dnyaneshwar Maharaj.	(10)	4	V	6.1.1	7
	b) **Discuss:** In brief, life, work and teachings of Bhagwan Mahaveer Vardhaman.	(10)	4	V	6.1.1	7

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End Semester Examinations June-July 2022 (DSE)

D. J. Y. D. Tech Civil Sem IV

(2021-22)

Program: S.Y. B. TECH
Course Code: PC-BTC-405
Course Name: HYDRAULIC ENGINEERING

Duration: 03 Hrs.
Maximum Points: 100
Semester: IV

13/7/22

Notes:

- Attempt ***any five*** questions.
- Answer to all sub questions should be grouped together.
- **Figure** to right indicates full marks.
- Assume suitable data wherever necessary and state it **clearly**.

Q. No.	Questions	Points	CO	BL	PI
1	(a) What do you understand by Dimensional homogeneity? Explain the term scale effects in model studies.	10	4	2	1.3.1
	(b) Obtain an expression for the thrust (F) developed by a propeller which depends upon the angular velocity (ω), approach velocity (V), dynamic viscosity (μ), density (ρ), propeller diameter (D) and the compressibility of the medium measured by the local velocity of sound (C). Use Buckingham's-π method.	10	4	4	2.1.2
2	(a) Explain with neat sketches; (i) Working of siphon; and (ii) Power transmission through pipe and nozzle.	10	1	2	1.3.1
	(b) What is HGL and TEL in pipe flow analysis? Draw HGL and TEL for three pipes connected in series carrying discharge Q from upper reservoir to lower reservoir. Diameter of pipes are D1, D2, D3 such that D1>D2 and D2<D3, lengths L1, L2, L3, friction factors f1, f2, f3 respectively. The difference in upper reservoir level and lower reservoir is H.	10	1	4	2.1.2
3	(a) Prove that the force exerted by a jet of water on a stationery semi-circular vane in the direction of the jet when the jet strikes at the center of the semi-circular vane is two times the force exerted by the jet on the stationery flat plate.	10	1	4	1.3.1
	(b) A 45 m/sec velocity jet of water strikes without shock on a series of vanes moving at 15 m/sec. The jet is inclined at an angle of 21^0 to the direction of motion of vanes. The relative velocity of jet at outlet is 0.82 times the value at inlet and the flow is radial. Determine hydraulic efficiency.	10	1	5	2.3.1
4	(a)Explain with neat sketch working of a hydroelectric power plant. Also differentiate between impulse and reaction turbine.	10	2	2	2.1.2

	(b) A Pelton wheel has a mean bucket speed of 12 m/sec and is supplied with water at a rate of 850 liters per second under head of 42 meter. If the bucket deflects the jet through an angle of 160^0, find the power developed by the turbine and its hydraulic efficiency. Take the coefficient of velocity as 0.96. Neglect friction in the bucket. Also determine the overall efficiency of the turbine if its mechanical efficiency is 82%.	10	2	4	2.3.1
5	(a) Explain: (i) Cavitations in centrifugal pump; and (ii) Work done by an impellor of a centrifugal pump	10	2	2	2.1.2
	(b) In an inward flow reaction turbine the diameter at inlet and outlet are 1.20m and 0.60 m. The hydraulic efficiency = 92%. Head = 45m. The velocity of flow at outlet = 2 m/sec. The discharge at outlet is radial. The vane angle at outlet is 150. Flow width is 0.10 m. at inlet and outlet. Determine (i) the guide blade angle (ii) vane angle at inlet and outlet.	10	2	4	3.1.6
6	(a)Write short notes on: (i) Minimum starting speed of a centrifugal pump; and (ii) Net Positive suction Head (NPSH).	10	2	2	2.1.2
	(b)Differentiate between flow through pipe and flow through open channel. Also define and explain for channel flow: Prismatic and Non-prismatic channels, Steady and unsteady flow and Uniform and non-uniform flow.	10	2	4	3.4.2
7	(a) Explain the significance of Specific energy, momentum equation and Specific force in an open channel flow. Discuss the criteria for minimum specific energy and maximum specific force.	10	3	4	2.3.1
	(b) Derive dynamic equation for gradually varied flow in case of a wide rectangular channel.	10	3	4	2.3.1

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SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations MAY 2022

(2021-22)

25/5/22

Program: S.Y. B. TECH S.Y.B.Tech (Civil) **Duration: 03 Hrs.**

Course Code: PC-BTC-405 Sem IV **Maximum Points: 100**

Course Name: HYDRAULIC ENGINEERING **Semester: IV**

Notes:

- Attempt ***any five*** questions.
- Answer to all sub questions should be grouped together.
- **Figure** to right indicates full marks.
- Assume suitable data wherever necessary and state it **clearly**.

Q. No.	Questions	Points	CO	BL	PI
1	(a)Explain: Dimensional homogeneity. Also explain distorted and undistorted models and scale effects in model studies.	10	4	2	1.3.1
	(b)The head loss due to friction 'hf' in a pipe depends upon diameter of pipe 'D', friction factor 'f', length of pipe 'L' and rate of flow through pipe 'Q'. Obtain an expression for loss of head using Buckingham's-π method.	10	4	4	2.1.2
2	(a)Explain with neat sketches: (i) working of pipes in series and pipes in parallel, and (ii) working of siphon	10	1	2	1.3.1
	(b) A 25 cm wrought iron pipeline 800 meter long discharges water 100 meter below the surface of a reservoir. Determine the diameter of the nozzle which will deliver the maximum power. Assume f = 0.022 and coefficient of velocity of the nozzle is 0.96.	10	1	4	2.1.2
3	(a)What is mean by water hammer? Obtain an expression for the rise in pressure in a thin elastic pipe of circular section in which the flow of water is stopped by sudden closure of valve.	10	1	4	1.3.1
	(b)Three pipes joined in series release water from 80 meter level to 35 meter level. The details of piping system are as given in **Table 1.** Considering minor and major losses in pipes, determine; discharge, velocity and head loss in each pipe.	10	1	5	2.2.3

Table 1

Pipe	Length (m)	Diameter (mm)	Friction Factor (f)
1	900	150	0.018
2	850	100	0.020
3	900	150	0.018

4	(a)Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceeds 50%.	10	2	2	2.1.2
	(b) A jet of water of diameter 50 mm. strikes a fixed plate in such a way that the angle between the plate and the jet is 30 degrees. If the force exerted in the direction of the jet is 1550 N, determine the rate of flow of water.	10	2	4	2.3.1
5	(a) Explain: working of a Pelton type turbine with neat sketch and derive an expression for hydraulic efficiency.	10	2	2	
	(b) A turbine is to operate under a head of 30 m and a speed of 300 rpm. The discharge is 15 m^3/sec. Assuming efficiency of 0.85, calculate the power developed. What would be the specific speed, power, discharge, rotational speed at a head of 20 m?	10	2	4	3.1.6
6	(a)Write short notes on: (i) Priming of a centrifugal pump and (ii) Pumps in parallel and series.	10	2	2	2.1.2
	(b) The internal and external diameters of the impeller of a centrifugal pump are 300 mm and 600 mm respectively. The pump is running at 900 r.p.m. The vane angles at inlet and outlet are 20^0 and 30^0 respectively. The water enters the impellor radially and velocity of flow is constant. Determine the work done by the impellor per unit weight of water.	10	2	3	3.4.2
7	(a)What is most economical channel section? Discuss prismatic and non-prismatic channels and derive the conditions for most economical triangular channel section.	10	3	4	2.3.1
	(b) Derive the dynamic equation for gradually varied flow (GVF) in case of a wide rectangular channel.	10	3	4	2.3.1

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Re-Examinations JULY 2022 (PC-BTC-405)

(2021-22)

S. Y. B. Tech Civil) Sem IV

Program: S.Y. B. TECH **Duration: 03 Hrs.**

Course Code: PC-BTC-405 **Maximum Points: 100**

Course Name: HYDRAULIC ENGINEERING **Semester: IV**

15/7/22

Notes:

- Attempt ***any five*** questions.
- Answer to all sub questions should be grouped together.
- **Figure** to right indicates full marks.
- Assume suitable data wherever necessary and state it **clearly**.

Q. No.	Questions	Points	CO	BL	PI
1	(a) Discuss hydraulic model testing, laws of similarities, distorted and undistorted models in dimensional analysis.	10	4	2	1.3.1
	(b) Explain Buckingham's –π theorem.	10	4	4	1.3.1
2	(a)Explain working of Siphon.	10	1	2	1.3.1
	(b) Explain pipes in series and pipes in parallel.	10	1	4	1.3.1
3	(a) Explain briefly the phenomenon of water hammer flow in pipe lines	10	1	4	1.3.1
	(b)Two pipes joined in series release water from 55 meter level to 30 meter level. Determine discharge **Table 1** Pipe 1: Length 300 m, Diameter 200 mm, Friction Factor 0.019 Pipe 2: Length 250 m, Diameter 100 mm, Friction Factor 0.021	10	1	5	2.2.3
4	(a)Explain Impulse momentum principle with and an example.	10	2	2	2.1.2
	(b) Show that the efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceeds 50%.	10	2	4	2.3.1
5	(a) Differentiate between Impulse turbine and reaction turbine. Give an example	10	2	2	1.3.1
	(b) Explain in brief performance characteristics curves of hydraulic turbines.	10	2	4	3.1.6
6	(a)Explain working of centrifugal pump. Highlight the importance of priming operation.	10	2	2	2.1.2
	(b) Discuss pumps in series, pumps in parallel and multistage pumps.	10	2	3	3.4.2

7	(a)What do you mean by most economical channel section? Derive the conditions for most economical rectangular channel section.	10	3	4	2.3.1
	(b) Differentiate between uniform and non-uniform flow. Also explain specific energy diagram.	10	3	4	2.3.1

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Bharatiya Vidya Bhavan's

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END SEMSTER EXAMINATION JULY 2022

D. J. Y. B. Tech (Civil) Sem IV

Program: Civil Engineering
Course Code: PC- BTC406
Course Name: Transportation Engineering

Duration: 3 Hours
Maximum Points: 100
Semester: IV

15/7/22

Notes:

1. Question No 1 is compulsory.
2. Attempt any four questions from remaining five questions.
3. Draw figure or table wherever required.

Q.No.	Questions	Points	CO	BL	PI
1	**Attempt any four**				
1 (a)	Define gauge and discuss different types of gauges.	5	CO 4	1	
1 (b)	Define Rail, Ballast and sleepers and draw cross-section of P-Way.	5	CO 4	1	
1 (c)	Define points and crossing with figure.	5	CO 5	1	
1 (d)	Define airport obstructions and enlist various obstructions. Draw figure for Inner Horizontal Surface	5	CO 2	1	
1 (e)	Explain any two runway patterns with neat sketch.	5	CO 3	2	
2 (a)	Design an exit taxiway which joins a runway and main parallel taxiway with following data: Total angle of turning is 42°, exit speed is 80 kmph, and Coefficient of friction is 0.12.	10	CO 3	4	
2 (b)	Explain in detail the various factors need to be considered while selecting site for airport	10	CO 2	1	
3 (a)	Briefly discuss runway and taxiway marking and lightening with help of figure.	10	CO 3	2	
3 (b)	If the basic runway length for an airport situated at an elevation of 360 m is 1900 meters, find the actual runway length required if the mean of average daily temperature and mean of maximum daily temperature obtained as 36°C and 42°C respectively. End to End (m) — Gradient (%) 0 to 300 — +1.00 300 to 600 — -0.50	10	CO 3	4	

END SEMSTER EXAMINATION JULY 2022

	600 to 1200 +0.50 1200 to 1500 +1.00 1500 to1800 -0.50 1800 to 2000 -0.40 2000 to 2400 -0.10				
4 (a)	Define Creep and explain theories of creep. Also explain the conning of wheels, tilting of rails, adzing of sleepers.	10	CO 4	2	
4 (b)	Define cant deficiency. A 5° branch curve diverges out from a 2° main curve in opposite direction of a meter gauge (MG) track. If the speed on branch line is restricted to 30kmph and permissible cant deficiency is 5.1 cm, what would be the speed on main line?	10	CO 5	4	
	.				
5 (a)	Draw a neat sketch of right-hand turnout and explain all component parts of a right-hand turnout.	10	CO 5	2	
5 (b)	Calculate the superelevation and the maximum permissible speed for a 2° BG transitioned curve on a high-speed route with a maximum sanctioned speed of 105 km/h. The speed for calculating the equilibrium superelevation as decided by the chief engineer is 70 km/h and the booked speed of goods trains is 45 km/h.	10	CO 5	4	
6 (a)	Social and Economic benefits of transportation system	5	CO 1	2	
6 (b)	Explain with neat sketch, different types of rail sections.	5	CO 4	2	
6 (c)	Define degree of curvature and derive expression for the same.	5	CO 5	4	
6 (d)	Explain step by step procedure of wind rose diagram type -I	5	CO 3	2	

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

Munshi Nagar, Andheri (West), Mumbai – 400058

End Semester Examination, (May, 2022)

Program : S. Y. B. Tech. Civil Engineering Sem IV Duration :3 Hours 30/5/22

Course code : BTC 406 Maximum Marks : 100

Name of the Course : Transportation Engineering Semester : IV

Instructions:

(i) Question Number 1 is compulsory

(ii) Solve any four questions from remaining six questions

(iii) Figures to the right indicate full marks and all questions carry equal marks

(iv) Assume any data if required, stating them clearly

(v) Use graph paper if required

Question No.	Question	Max. Marks	Course Outcome Number	Module No.
Q.1.	Solve any four **(5 marks each sub question)**	20	01	01
A	Discuss Role of Transport in the society.		01	01
B	Explain with sketch coning of wheel and tilting of rail.		01	04
C	What is creep of rail? How will you measure it?		01	05
D	Explain airport classification system.		01	02
E	How will you decide the location of Exit Taxiway.		01	03
Q.2.				
A	Draw a Neat Sketch of Aircraft and show all its component parts. Also, Discuss wing of the aircraft with respect to (i) lift to drag ratio, (ii) surface area, (iii) aspect ratio, (iv) camber shape of wing.	10	03	04
B	Enlist the advantages and disadvantages of Uniformity of gauge.	05	03	04
C	Derive the relationship between super elevation, speed, Gauge and radius of circular curve.	05	03	05
Q.3				
A	Discuss with neat sketch (i) Take off climb surface, (ii) Approach surface, (iii) Inner Horizontal surface	12	01	02

B	*Design an exit taxiway joining* runway and parallel main taxiway. The total angle of turn is 30^0 and turning speed 80 km/hr. draw a neat sketch showing all design elements	**08**	**01**	**03**
Q.4				
A	Discuss with sketch how you will decide the Basic Length of Runway.	**08**	**01**	**02**
B	The length of runway under standard condition is 2100 m. the airport is to be provided at an elevation of 380 m above mean sea level. The gradient need to be provided at the site under consideration is given Table 1. The monthly mean temperatures of the atmosphere at a particular site where airport has to be constructed are given in Table 2. Apply the necessary correction as per ICAO and FAA and calculate the corrected length of runway.	**12**	**01**	**02**
Q.5				
A	Discuss different types of engine used in aircraft	**06**	**01**	**02**
B	Explain with sketch how the movement of aircraft can control in space.	**06**	**01**	**02**
C	Enumerate the various factors you would like to keep in mind while selecting suitable site for the Airport.	**08**	**01**	**02**
Q.6.				
A	What is gauge. Discuss different types of gauge.	**05**	**02**	**04**
B	Discuss with sketch different types of joints	**05**	**02**	**04**
C	The average wind data collected at particular site is given Table 3. Determine calm period, orientation of runway and wind coverage. Assume permissible cross wind component = 25 km/hr. plot wind rose diagram considering (i) Direction and total duration (ii) Direction, duration and intensity of wind	**10**	**03**	**02**
Q.7.				
A	write short notes on different types of Gradient	**05**	**01**	**04**
B	Write short notes of sleeper density.	**05**	**01**	**03**
C	Using the sleeper density of (n + 5) estimate the number of rail and sleepers required for construction of 1 km long (i) broad gauge (ii) meter gauge railway track. Also, calculate the number of fish plate and fish bolt required for construction.	**10**	**03**	**03**

Q.4 (b) Table 1.

End to end runway length (m)	0 to 300	300 to 1200	1200 to 1800	1800 to 2400	2400 to 3500
Gradient (%)	+ 1.0	- 0.50	+ 0.50	- 0.60	+0.50

Q.4. (b) Table 2.

Month	Mean value of average daily temperature	Mean value of Maximum daily temperature	Month	Mean value of average daily temperature	Mean value of Maximum daily temperature
Jan	3.00	5.50	July	32.6	37.7
Feb	15.5	17.0	Aug	30.5	35.5
Mar	20.0	23.4	Sept	27.4	31.5
Apr	25.6	32.3	Oct	22.8	28.3
May	37.7	47.4	Nov	12.9	18.0
June	40.4	50.60	Dec	6.70	12.3

Q.6 (c) Table 3.

Wind direction	Duration of wind in percentage		
	6.4 to 25 km/hr	25 to 50 km/hr	50 to 75 km/hr
S	4.5	1.3	0.1
SSW	3.3	0.8	0
SW	1.8	0.1	0
WSW	2.7	0.3	0
W	2	0.4	0
WNW	5.3	0.1	0
NW	6.3	3.2	0.1
NNW	7.4	7.7	0.3
N	4.6	2.2	0
NNE	2.4	0.9	0
NE	1.1	0.1	0
ENE	3.6	0.4	0
E	1.8	0.3	0
ESE	5.9	2.6	0.2
SE	5.8	2.4	0.2
SSE	6.8	4.9	0.3

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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Munshi Nagar, Andheri (W) Mumbai – 400058

S.Y.B.Tech Civil Sem IV 18/7/22.

RE-EXAMINATION JULY 2022

Program: S. Y. B. Tech. Civil

Course Code: PC – BTC 406

Course Name: Transportation Engineering

Duration: 3 Hours

Maximum Points: 100

Semester: IV

Notes:

(i) **Question 1 is compulsory**

(ii) **Solve any four out of remaining six questions**

(iii) **Assume suitable data if required**

Q.No.	Questions	Points	CO	Module NO.
Q.1.				
(a)	Discuss the systematic approach for expansion of existing airport or construction of new airport	10	1	2
(b)	What are the assumption made while calculating the basic length of runway. Discuss step by step procedure for calculation of corrected length from basic length of runway.	10	1	2
Q.2.				
(a)	Derive the relationship between superelevation, speed, Gauge and radius of circular curve. What are its limiting values for different gauges.	10	2	3
(b)	A 5^0 curve diverges from 2^0 main curve in reverse direction in a layout of broad gauge yard. If the speed on branch line is restricted to 30 km/hr. determine the restricted speed on main line.	10	2	3
Q. 3.				
(a)	what is turnout. Explain with sketch left and right hand turnout	06	2	3
(b)	Derive the expression for curve lead and switch lead.	06	2	3
(c)	Calculate the elements required to set out 1 in 8 turnout, taking off from straight broad gauge track with its curve starting from toe of switch. Heel divergence = 11.4	08	2	3
Q. 4.	write short notes on,(each sub question carries 4 marks)	20	2	3
(a)	Outer signal,			
(b)	Home Signal			
(c)	Ballast less track			
(d)	Terminal station			
(e)	Types of Marshalling yards.			

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RE- EXAMINATION JULY 2022

Q.5.				
(a)	Discuss with neat sketch Runway and Taxiway Marking	**10**	**1**	**2**
(b)	Discuss the points you will consider while selecting the site for station.	**10**	**2**	**3**
Q.6.				
(a)	Discuss the theoretical nose of crossing and actual nose of crossing	**06**	**2**	**3**
(b)	Explain the relationship between number of crossing, permissible speed and angle of crossing.	**06**	**2**	**3**
(c)	Draw a neat sketch of double lined turn out showing important component part of point and crossing.	**08**	**2**	**3**
Q.7.				
(a)	Draw a layout plan of Airport and show all the details	**06**	**1**	**2**
(b)	Aircraft Parking Configuration	**06**	**1**	**2**
(c)	The length of runway under standard condition is 1500 m. the airport reference temperature is 25^0c the airport is to be provided at elevation of 125 m above mean sea level. Calculate the corrected length of runway for following data.	**08**	**1**	**2**

End to end runway length (m)	**0 to 300**	**300 to 900**	**900 to 1500**	**1500 to 1800**	**1800 to 2100**
Gradient (%)	+ 1.0	- 0.20	+ 0.50	+ 1.0	-0.30

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SARDAR PATEL COLLEGE OF ENGINEERING
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Munshi Nagar Andheri (W) Mumbai 400058

End Semester Examination
DSY July 2022 D. J. Y. A. Tech (Civil) Sem IV

Max. Marks: 100 **Duration: 3 Hrs**

Class: S.Y. B. Tech **Semester: IV**

Name of the Course: Environmental Engineering I **Program: Civil**

Course Code: BTC407

20/7/22

Instructions:

Q1 is compulsory. Attempt any four questions out of remaining five

Draw neat sketches/diagrams wherever required

Assume suitable data if necessary and state them clearly

Figure on right indicate **maximum points** for the given question, **course outcomes attained, Bloom's Level** and **Performance Indicators**

Q1	**Answer the following Questions**	(20)	CO	BL	PI
(a)	A town of Sarchu in Lahaul has a population of **30,000 in 2010**. The water supply scheme is to be developed for the area for the year **2040**. The past census records are provided in **table 1**. Calculate the population for which water supply system is to be designed using any two appropriate methods for newly developing city.	(05)	CO1 ,CO 4	4-5	3.4.2
(b)	As a city engineer of Sarchu city which water demands are to be considered for a growing city. Further enlist the factors affecting rate of demand.	(05)	CO1 , CO2	4-5	3.3.2
(c)	For the city of Sarchu as mentioned in Q1(a) there are **two sources** of water **surface water source** (Canal). **Deliberate** on the characteristics of water from each source. **Draw** a flowsheet for the treatment of surface water source. **Describe** the function of each unit in the flowsheet. **Comment** on the efficiency of each unit with respect to relevant characteristic. The iron and manganese content is high in water. What would you suggest to do to reduce the levels.	(10)	CO1 - CO4	3-5	3.2.1
Q2	**Answer the following questions**				
(a)	A **bell mouth canal intake is to be designed for Sarchu** considering population obtained in Q1 (a) drawing water from a canal which runs for 8 hrs a day with a depth of 2 m. Calculate head loss in intake conduit if treatment works are 0.30 km away. Draw a neat sketch. Consumption of the town is to be considered 100 lpcd. Assume velocity through screens and bell mouth to be less than 15cm/sec and 30 cm/sec. (for screens consider it is made of vertical iron bars of 20 mm dia and placed at 3 to 5 cm c to c). Design for average discharge. Assume min water level in canal to be 0.3 m below FSL. Use head	(10)	CO2 , CO3	3-4	5.3.1

Table 1.

Year	1970	1980	1990	2000	2010
Population	11,000	15,000	17,500	22,000	30,000

	loss equation as $v=0.85C_H R^{0.63} S^{0.54}$ (C_H= 130 dependent on pipe material, R is hydraulic mean depth and for circular section it is d/4; and S is slope of energy line or Hl/L)				
(b)	Design rapid mix unit for the city of Sarchu for population of 2040 with all checks. Use appropriate value of μ.	(5)	CO1 ,CO 2	3-5	4.2.2
(c)	Lime and soda were used for softening in Sarchu for treatment of following impurities $CaSO_4$ = 120 mg/L; NaCl= 130 mg/L; $MgCl_2$= 80 mg/L. Compute the quantities of chemicals required for Sarchu in year 2040. Assume **soda ash and lime purity 80%. (Consider data in Q1(a))**	(5)	CO3 - CO4	3-4	3.2.2
Q3	**Answer the following questions**	(20)			
(a)	Derive Stoke's law for discrete particle. Design a circular coagulation aided sedimentation tank for Sarchu considering 2040 population and water demand 100 lpcd.	(10)	CO2 - CO4	2-3	2.2.1
(b)	A cross flow horizontal paddle wheel flocculator is designed for Sarchu city for population of 2040 and water demand 100 lpcd. The mean G value is $30Sec^{-1}$ and detention time is 40 min. There are three compartments with $G1=50sec^{-1}$, $G2= 25Sec^{-1}$ and $G3 = 15sec^{-1}$. Basins width is 15 m. Speed of blades relative to water is 0.75 times peripheral speed of the blade. Cd is 1.5. Use appropriate value of μ. Find (1) **Dimensions of the basin** (2) **Number of blades and geometry of basin** (3) **Power requirements** (4) **Rotational speed of shaft**	(10)	CO2 - CO4	3-4	3.2.1
Q4	**Answer any two of the following questions**	(20)			
(a)	**Explain filter troubles. Design rapid sand filter for (size and underdrainage system)** for the population for **the year 2040** for Sarchu town having water demand **100 lpcd.**	(15)	CO1 - CO4	3-5	5.3.2
(b)	Explain various disinfectants. Find chlorine consumed in kg/day and chlorine dosage in mg/L for the city of Sarchu in 2040 if the residual chlorine **is 0.2 mg/L** and a **chlorine demand is 0.6 mg/L and average water demand of 100 lpcd.**	(05)	CO3 ,CO 4	2-4	5.4.1
Q5	**Answer the questions**	(20)			
(a)	Deliberate on quality of ground water and surface water and what techniques are used to purify these water types	(05)	CO3	2	2.3.1
(b)	Explain any 3 techniques to treat taste, color and odor in detail	(10)	CO3	2	2.3.2
(c)	Explain the process of removal of hardness from water	(05)	CO3	2,3	4.3.2
Q6	Write notes on any **four**	(20)	CO2	2	2.3.3
(i)	Electro-dialysis	(05)			
(ii)	Reverse osmosis	(05)			
(iii)	Water distribution systems	(05)			
(iv)	Iron and Manganese in water and their removal	(05)			
(v)	Ion Exchange	(05)			
Q7	**Answer the questions**				
(A)	**Fill in the blanks**	(02)	CO1	1	1.2.1

	i. _____ is universal disinfectant ii. Color and odor can be removed by _____ and _____ iii. Typical size of colloidal particles is _____ to _____ iv.Filteration removes _____ and _____ v. The _____valve is used in water distribution system vi._____ and _____ are the coagulants used in water treatment. vii. _____ and _____ are two methods to remove salts in water treatment viii._____ and _____ are shallow sedimentation devices ix._____ is a naturally occurring ion exchange. x.pH of alkaline water is _____.				
(B)	**Explain the following (any two)**	**10 (2*5)**	**CO2 ,CO 3**	**5**	**5.2.1**
(i)	Jar test				
(ii)	MPN Test				
(iii)	Super and de chlorination				

Formula Sheet

$P_n = P_o\left[1+\frac{r}{100}\right]^n$ $P_n = P_o + n\bar{x} + \frac{n(n+1)}{2}\bar{y}$ $\log_e\left[\frac{P_s - P}{P}\right] - \left[\frac{P_s - P_o}{P_o}\right] = -kP_s * t$ $P_n = (P_o + n\bar{x})$ $r = \sqrt[t]{r_1 * r_2 * r_3 * \ldots\ldots * r_n}$	Al=27 Ca=20 C=12 O=16 S=32 Cl=35.5 H=1 Na=23 Fe= 55.5 Mg=24 Si=14 H:D= 2:1	WLR=Q/B WLR= Q/2πR DT= V/Q SOR= 12-20 $m^3/d/m^2$ V= 0.849 C $R^{0.63}$ $S^{0.54}$ SOR= 24-30$m^3/d/m^2$ WLR= 200$m^3/m^2/d$ DT= 20 to 50 min Minimum distance between successive baffle walls 0.45 m(d) Clear opening at end of baffle and basin wall =1.5 (d)
SA=volume/SOR	G =300-700s^{-1} 0.5 min to 1 min	P=$\frac{1}{2}C_d\rho.A_p.v_r^3$ $C_d = 1.8\ for\ flat\ paddles$ $\rho = 998kg/m^3$ $v_r = (1-0.25)v_p$
Ratio of length to diameter of lateral ≤ 60 Spacing of laterals= spacing of orifices= 150 to 300 mm Dia of perforations 5 to 12 mm (spacing 80 mm for 5 and 200 mm for 12mm) Total area of perforations≤ 0.5 Total c/s area of laterals Total area of perforation = 0.002 to 0.003 Entire filter area Area of manifold= 1.5 to 2 times laterals	$v_s = \frac{1}{18}\frac{g}{v}(S_s-1) * d^2$ Value of υ=1.002X10^{-6} m^2/sec $v_d = \sqrt{\left(\frac{8\beta}{f'}\right)(S_s-1)dg}$ $f' = 0.025 - 0.03$ g=9.8m/s^2	Q/A; Q/ perimeter; Q/b; V/Q V= D^2(0.011D+0.785H) Rate = 3000-6000litre/hr/m2 G^2 = P/μV = $C_D A\rho v^3/2\mu V$

Rate of filtration = 300 to 500l/hr/m^2 Rate of filtration = 3000-6000l/hr/m^2 Max. demand= 1.8 Q		
$G = \sqrt{\frac{P}{\mu * V}}$ μ=1.0087*10^{-3}Ns/m^2	$P = F_D * v_r$	$G * t = \frac{V}{Q} * \sqrt{\frac{P}{\mu V}} = \frac{\sqrt{PV/\mu}}{Q}$

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End Semester Examination
May 2022

1/6/22

Max. Marks: 100 **Duration: 3 Hrs**

Class: S.Y. B. Tech (Civil) Sem IV **Semester: IV**

Name of the Course: Environmental Engineering I **Program: Civil**

Course Code: BTC407

Instructions:

Q1 is compulsory. Attempt any four questions out of remaining five

Draw neat sketches/diagrams wherever required

Assume suitable data if necessary and state them clearly

Figure on right indicate **maximum points** for the given question, **course outcomes attained, Bloom's Level** and **Performance Indicators**

		(20)	CO	BL	PI
Q1	**Answer the following Questions**				
(a)	A town of Khirsu in Uttarakhand has a population of **40,000 in 2010**. The water supply scheme is to be developed for the area for the year **2040**. The past census records are provided in **table 1**. Calculate the population for which water supply system is to be designed using any two appropriate methods for newly developing city.	**(05)**	**CO1 ,CO 4**	**4-5**	**3.4.2**
(b)	As a city engineer of Khirsu city which water demands are to be considered for a growing city. Further enlist the factors affecting rate of demand.	**(05)**	**CO1 , CO2**	**4-5**	**3.3.2**
(c)	A **bell mouth canal intake is to be designed for Khirsu** considering population obtained in Q1 (a) drawing water from a canal which runs for 10 hrs a day with a depth of 2 m. Calculate head loss in intake conduit if treatment works are 0.35 km away. Draw a neat sketch. Consumption of the town is to be considered 120 lpcd. Assume velocity through screens and bell mouth to be less than 15cm/sec and 30 cm/sec. (for screens consider it is made of vertical iron bars of 20 mm dia and placed at 3 to 5 cm c to c). Design for average discharge. Assume min water level in canal to be 0.4 m below FSL. Use head loss equation as $v=0.85C_HR^{0.63}S^{0.54}$ (C_H= 130 dependent on pipe material, R is hydraulic mean depth and for circular section it is d/4; and S is slope of energy line or Hl/L)	**(10)**	**CO2 , CO3**	**3-4**	**5.3.1**
Q2	**Answer the following questions**				
(a)	For the city of Khirsu as mentioned in Q1(a) there are **two sources** of water **surface water source** (Canal). **Deliberate** on the characteristics of water from each source. **Draw** a flowsheet for the treatment of surface water source. It is found that the hardness level is high around 300 mg/L. Suggest additional	**(10)**	**CO1 - CO4**	**3-5**	**3.2.1**

Year	1970	1980	1990	2000	2010
Population	16,000	20,500	25,000	31,000	40,000

	units. **Describe** the function of each unit in the flowsheet. **Comment** on the efficiency of each unit with respect to relevant characteristic.				
(b)	Design rapid mix unit for the city of Khirsu for population of 2040 with all checks	(5)	CO1 ,CO 2	3-5	4.2.2
(c)	Lime and soda were used for softening in Khirsu for treatment of following impurities $CaCO_3$= 100 mg/L; $MgSO_4$= 120 mg/L; NaCl= 130 mg/L; $MgCl_2$= 80 mg/L. Compute the quantities of chemicals required for Khirsu in year 2040. Assume **soda ash and lime purity 90%. (Consider data in Q1(a))**	(5)	CO3 - CO4	3-4	3.2.2
		(20)			
Q3	**Answer the following uestions**				
(a)	Explain the concept **Ideal Settling Tank. Design ideal** settling tank for the population for **the year 2040** for Khirsu town having average water demand **100 lpcd.**	(10)	CO2 - CO4	2-3	2.2.1
(b)	A cross flow horizontal paddle wheel flocculator is designed for Khirsu city for population of 2040. The mean G value is 30Sec^{-1} and detention time is 40 min. There are three compartments with G1=50sec^{-1}, G2= 25Sec^{-1} and G3 = 15sec^{-1}. Basins width is 15 m. Speed of blades relative to water is 0.75 times peripheral speed of the blade. Cd is 1.5 Find (1) **Dimensions of the basin** (2) **Number of blades and geometry of basin** (3) **Power requirements** (4) **Rotational speed of shaft**	(10)	[redacted] - CO4	[redacted]	[redacted]
		(20)			
Q4	**Answer any two of the following questions**				
(a)	**Explain the need of filtration and filtration mechanism. Design rapid sand filter for (size and underdrainage system)** for the population for **the year 2040** for Khirsu town having water demand **100 lpcd.**	(15)	CO1 - CO4	3-5	5.3.2
(b)	Explain the characteristic of a good disinfectant. Find chlorine consumed in kg/day and chlorine dosage in mg/L for the city of Khirsu in 2040 if the residual chlorine **is 0.2 mg/L** and a **chlorine demand is 0.6 mg/L and average water demand of 100 lpcd.**	(05)	CO3 ,CO 4	2-4	5.4.1
		(20)			
Q5	**the uestions**				
(a)	Deliberate on quality of ground water and surface water and what techniques are used to purify these water types	(05)	CO3	2	2.3.1
(b)	Explain any 3 techniques to treat taste, color and odor in detail	(10)	CO3	2	2.3.2
(c)	process of removal of hardness from water	(05)	CO3	2,3	4.3.2
		(20)	CO2	2	2.3.3
Q6	Write notes on any **four**	(05)			
(i)	Electro-dialysis	(05)			
(ii)	verse osmosis	(05)			
(iii)	Disinfectants	(05)			
(iv)	Iron and Manganese in water and their removal	(05)			
(v)	Ion Exchange				
Q7	**Answer the questions**	(10)	CO1	1	1.2.1
(A)	**Fill in the blanks**				
	i._____ and _____ are the coagulants used in water treatment.				

	ii. _____ and _____ are two methods to remove salts in water treatment iii._____ and _____ is used to remove salinity in water. iv. _____ and _____ are shallow sedimentation devices v._____ is a naturally occurring ion exchange. vi.pH of alkaline water is _____. vii.Aeration of water removes_____ and _____ viii._____ and _____ are methods for population forecasting ix. _____ and _____ techniques are used for fluoride removal x._____ and _____ type of water distribution systems are typically used in Indian cities				
(B)	**State true or false with reasons (Give reasons for both true and for false statements)**	**10 (2*5)**	**CO2 ,CO 3**	**5**	**5.2.1**
(i)	Aeration is used to remove hardness				
(ii)	The scraping of 30 cm of sand is the method used to clean slow sand filter				
(iii)	Geometric increase method is used for developed cities				
(iv)	Two pipe system is the best plumbing method for planned cities				
(v)	Dechlorination is re uired during epidemics				

Formula Sheet

$P_n = P_o\left[1+\frac{r}{100}\right]^n$ $P_n = P_o + n\bar{x} + \frac{n(n+1)}{2}\bar{y}$ $\log_e\left[\frac{P_s - P}{P}\right] - \left[\frac{P_s - P_o}{P_o}\right] = -kP_s * t$ $P_n = (P_o + n\bar{x})$ $r = \sqrt[n]{r_1 * r_2 * r_3 * \ldots\ldots * r_n}$	Al=27 Ca=20 C=12 O=16 S=32 Cl=35.5 H=1 Na=23 Fe= 55.5 Mg=24 Si=14 H:D= 2:1	WLR=Q/B WLR= Q/2πR DT= V/Q SOR= 12-20 $m^3/d/m^2$ $V= 0.849\ C\ R^{0.63}\ S^{0.54}$ SOR= 24-30$m^3/d/m^2$ WLR= 200$m^3/m^2/d$ DT= 20 to 50 min Minimum distance between successive baffle walls 0.45 m(d) Clear opening at end of baffle and basin wall =1.5 (d)
SA=volume/SOR	G =300-700s^{-1} 0.5 min to 1 min	$P=\frac{1}{2}C_d\rho.A_p.v_r^3$ $C_d = 1.8\ for\ flat\ paddles$ $\rho = 998kg/m^3$ $v_r = (1-0.25)v_p$
Ratio of length to diameter of lateral ≤ 60 Spacing of laterals= spacing of orifices= 150 to 300 mm Dia of perforations 5 to 12 mm (spacing 80 mm for 5 and 200 mm for 12mm) Total area of perforations≤ 0.5 Total c/s area of laterals	$v_s = \frac{1}{18}\frac{g}{v}(S_s - 1) * d^2$ Value of υ=1.002X10^{-6} m^2/sec $v_d = \sqrt{\left(\frac{8\beta}{f'}\right)(S_s - 1)dg}$	Q/A; Q/ perimeter; Q/b; V/Q $V= D^2(0.011D+0.785H)$ Rate = 3000-6000litre/hr/m2 $G^2 = P/\mu V = C_D A\rho v^3/2\mu V$

Total area of perforation = 0.002 to 0.003 Entire filter area Area of manifold= 1.5 to 2 times laterals Rate of filtration = 300 to 500l/hr/m^2 Rate of filtration = 3000-6000l/hr/m^2 Max. demand= 1.8 Q	$f' = 0.025 - 0.03$ g=9.8m/s^2	
$G = \sqrt{\frac{P}{\mu * V}}$ μ=1.0087*10^{-3}Ns/m^2	$P = F_D * v_r$	$G * t = \frac{V}{Q} * \sqrt{\frac{P}{\mu V}} = \frac{\sqrt{PV/\mu}}{Q}$

ALL THE BEST

Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to University of Mumbai)
Munshi Nagar Andheri (W) Mumbai 400058

Reexam 2022; July 2022

S.Y. B.Tech (Civil) Sem IV

Max. Marks: 100 **Duration: 3 hrs**

Class: S.Y B. Tech **Semester: IV**

Name of the Course: Environmental Engineering I **Program: Civil**

Course Code:BTC407

20/7/22

Instructions:

- **Attempt 5 questions out of 7.**
- **Draw neat sketches/diagrams wherever required and wherever design is asked.**
- **Assume suitable data if necessary and state them clearly**
- Figure on right indicate **maximum points** for the given question, **course outcomes attained, Bloom's Level** and **Performance Indicators**
- **All the best**

		Marks	CO	BL	PI
Q1	**Answer the following questions:**	**(20)**	**1-4**	**4-6**	**4.3.1**
(a)	A town of Hrishikesh in Uttarakhand has a population of **1,00,000 in 2010**. The water supply scheme is to be developed for the area for the year **2040**. The past census records are provided in **table 1**. Calculate the population for which water supply system is to be designed using **any** two appropriate methods for developed city.	**(10)**			
	Table 1.				
	Year | 1970 | 1980 | 1990 | 2000 | 2010				
	Population | 36,000 | 40,500 | 55,000 | 80,000 | 1,00,000				
(b)	**Hrishikesh** has many **small scale industries** around it. The king "Hrinyakashyap" orders to find **physical, chemical and biological parameters of water of Ganga to you**. As an environmental engineer **which parameters** should be considered? **Explain** in detail parameters to be considered while deciding the quality of water in Ganges.	**(10)**			
Q2	**Answer the following questions:**	**(20)**	**1-4**	**2, 6**	**5.1.2**
(a)	Based on the parameters evaluated for Ganga, draw a flowsheet of **watertreatment facility** required for **Hrishikesh** explaining the **reductions ofimportant parameters** and **functions of various units in detail (showing reductions of parameters required)** of the facility. **List down additional units** required to remove the like hardness and color.	**(20)**			
Q3	**Answer the following questions:**	**(20)**	**1-4**	**5, 6**	**4.2.2**
(a)	Ministry of water resources of India has come up with demarcation of a particular Hrishikesh region having population of 100000 and water demand 90lpcd. Design a bell mouth canal intake for each Hrishikesh	**(15)**			

	area (depending onyour data) drawing water from a canal which runs only for 8 hrs a day with a depth of 2.5 m. Also calculate head loss in intake conduit if treatment works are 0.2km away. Draw a neat sketch. Assume velocity through screens and bell mouth as 20 cm/sec and 35 cm/sec (for screens considerit is made of vertical iron bars of 15 mm dia and placed at 3 to 5 cm c to c). Design for average discharge. Assume min water level in canal to be 0.4 m below FSL. Use head loss equation as • $v=0.85\ C_H R^{0.63} S^{0.54}$ (C_H= 130 dependent on pipe material, R is hydraulic mean depthand for circular section it is d/4; and S is slope of energy line or Hl/L)				

(b)	Articulate on factors to be considered while selecting an area for intake and enlist various types of intakes	**(05)**			
Q4	**Answer the questions**	**(20)**	**2-4**	**4,5, 6**	**5.1.3**
(a)	Explain and Analyze the need of Jar Test	**(05)**			
(b)	Design a mechanical rapid mix unit for the area of Hrishikesh for 100000 population and 90 lpcd demand. Take value of μ as 1.0089E-03. Computepower requirements and give checks.	**(10)**			
(c)	Design a plain sedimentation tank for the same population and demand of Hrishikesh	**(05)**			
Q5	**Answer the following questions:**	**(20)**	**3-4**	**5,6**	**6.1.2**
(a)	Articulate on the need of flocculation. Design gravity type of flocculator for same population and demand of Hrishikesh. Assume any other data which is required. Enough space is available	**(20)**			
Q6	**Answer the following questions:**	**(20)**	**1-4**	**5,6**	**6.3.2**
(a)	Design rapid sand filter for the design flow of Hrishikesh(with under drains andwash water troughs)	**(20)**			
Q7	Answer the following questions	**(20)**	**1-4**	**4,5, 6**	**5.3.2**
(a)	Develop a plan for disinfection of rural water well. Rationalize your plan.	**(05)**			
(b)	Illustrate distribution system design with figures, According to you which one is the best for Hrishikesh and why?	**(05)**			
(c)	Compare techniques to defluoridation. According to you, which is the best technique and why?	**(05)**			
(d)	Explain filter troubles	**(05)**			

FORMULA SHEET

$P_n = P_o\left[1+\frac{r}{100}\right]^n$ $P_n = P_o + n\bar{x} + \frac{n(n+1)}{2}\bar{y}$ $\log_e\left[\frac{P_s - P}{P}\right] - \left[\frac{P_s - P_o}{P_o}\right] = -kP_s * t$ $P_n = (P_o + n\bar{x})$ $r = \sqrt[t]{r_1 * r_2 * r_3 * \ldots\ldots * r_n}$	Al=27 Ca=40 C=12 O=16 S=32 Cl=35.5 H=1 Na=23 Fe= 55.5 Mg=24 Si=14 H:D= 2:1	WLR=Q/B WLR= Q/2πR DT= V/Q SOR= 12-20 $m^3/d/m^2$ V= 0.849 C $R^{0.63}$ $S^{0.54}$ SOR= 24-30$m^3/d/m^2$ WLR= 200$m^3/m^2/d$ DT= 20 to 50 min Minimum distance between successive baffle walls 0.45 m(d) Clear opening at end of baffle and basin wall =1.5 (d)
SA=volume/SOR	G =300-700s^{-1} 0.5 min to 1 min	P=$\frac{1}{2}C_d\rho.A_p.v_r^3$ $C_d = 1.8\ for\ flat\ paddles$ $\rho = 998kg/m^3$ $v_r = (1-0.25)v_p$
Ratio of length to diameter of lateral ≤ 60 Spacing of laterals= spacing of orifices= 150 to 300 mm Dia of perforations 5 to 12 mm (spacing 80 mm for 5 and 200 mm for 12mm) Total area of perforations≤ 0.5 Total c/s area of laterals Total area of perforation = 0.002 to 0.003 Entire filter area Area of manifold= 1.5 to 2 times laterals Rate of filtration = 300 to 500l/hr/m^2 Rate of filtration = 3000-6000l/hr/m^2 Max. demand= 1.8 Q	$v_s = \frac{1}{18}\frac{g}{v}(S_s - 1) * d^2$ Value of υ=1.002X10^{-6} m^2/sec $v_d = \sqrt{\left(\frac{8\beta}{f'}\right)(S_s - 1)dg}$ $f' = 0.025 - 0.03$ g=9.8m/s^2	Q/A; Q/ perimeter; Q/b; V/Q V= D^2(0.011D+0.785H) Rate = 3000-6000litre/hr/m2 G^2 = P/μV = $C_D A\rho v^3$/ 2μV
$G = \sqrt{\frac{P}{\mu * V}}$ μ=1.0087*10^{-3}Ns/m^2	$P = F_D * v_r$	$G * t = \frac{V}{Q} * \sqrt{\frac{P}{\mu V}} = \frac{\sqrt{PV/\mu}}{Q}$