

**PREVIOUS SEMESTER EXAMINATION DECEMBER-2022**Program: CIVIL *S. Y. A. Fees Civilly Less* Duration: 03 HoursCourse Code: BS-BTC401 *Old course*

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 IN TS	CO	BL	Module No.														
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 $\frac{1}{4}$ . What is the probability of 4 successes in 6 independent trials?	10	1	2	2														
QI b)	Given below is the probability distribution of a drv x with mean=16 then find 'a' & 'b' and variance of x <table border="1" style="margin-left: 20px;"> <tr> <td>x</td> <td>8</td> <td>12</td> <td>16</td> <td>20</td> <td>24</td> </tr> <tr> <td>P(x)</td> <td>1/8</td> <td>a</td> <td>b</td> <td>1/4</td> <td>1/12</td> </tr> </table>	x	8	12	16	20	24	P(x)	1/8	a	b	1/4	1/12	10	3	1	3		
x	8	12	16	20	24														
P(x)	1/8	a	b	1/4	1/12														
QII a)	Verify whether the following functions can be looked upon as probability density function? $f(x) = \frac{1}{2}e^{- x }, -\infty < x < \infty$	06	1	2	3														
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	3														
QII c)	Compute spearman's rank correlation coefficient for the following data <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>10</td> <td>12</td> <td>18</td> <td>18</td> <td>15</td> <td>40</td> </tr> <tr> <td>Y</td> <td>12</td> <td>18</td> <td>25</td> <td>25</td> <td>50</td> <td>25</td> </tr> </table>	X	10	12	18	18	15	40	Y	12	18	25	25	50	25	08	1	2	1
X	10	12	18	18	15	40													
Y	12	18	25	25	50	25													
QIII a)	Two cards are drawn simultaneously from a well-shuffled deck of 52 cards. Compute the variance for the number of aces.	10	3	2	2														
QIII b)	The sales-data of an article in six shops before and after a special promotional campaign are as under <table border="1" style="margin-left: 20px;"> <tr> <td>Shops</td> <td>A</td> <td>B</td> <td>C</td> <td>D</td> <td>E</td> <td>F</td> </tr> </table>	Shops	A	B	C	D	E	F	10	1	2	4							
Shops	A	B	C	D	E	F													



# Bharatiya Vidya Bhavan's SARDAR PATEL COLLEGE OF ENGINEERING

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



## PREVIOUS SEMESTER EXAMINATION DECEMBER-2022

	Before Campaign	53	28	31	48	50	42				
	After Campaign	58	29	30	55	56	45				
	Can the campaign be judged to be a success at 5% LOS.										
QIV a)	A radioactive source emits particles at a rate of 10 per minute in accordance with Poisson law. Each particle emitted has a probability of $\frac{2}{5}$ being recorded. Find the probability that atleast 4 particles are recorded in a 2 minute period.							06	1	3	2
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	5
QIV c)	Compute spearman's rank correlation coefficient for the following data							08	1	2	1
	X	10	12	18	18	15	40				
	Y	12	18	25	25	50	25				
QV a)	Seven coins are tossed and number of heads obtained is noted. The experiment is repeated 128 times and following distribution is obtained.							10	1	1	2
	No. of heads	0	1	2	3	4	5	6	7		
	Frequency	7	6	19	35	30	23	7	1		
	Fit a Binomial distribution if the nature of coins is unknown.										
QV b)	Investigate the association between the darkness of eyecolour in father and son from the following data							10	3	2	5
	Colour of father's eyes										
		Dark			Not Dark						
	Dark(Son)	48			90						
	Not Dark(Son)	80			782						
	Total	128			872						



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**PREVIOUS SEMESTER EXAMINATION DECEMBER-2022**

QVI a)	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	10	2	1	4														
QVI b)	A die is thrown 264 times with the following results <table border="1" style="width: 100%; border-collapse: collapse;"> <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> <p>Show that the die is biased</p>	No appeared on die	1	2	3	4	5	6	Frequency	40	32	28	50	54	60	10	1	3	2
No appeared on die	1	2	3	4	5	6													
Frequency	40	32	28	50	54	60													
QVI c)	Find the angle between the lines of regression	08	1	3	1														
QVI I a)	Fit a poisson distribution for the following data and also test the goodness of fit <table border="1" style="width: 100%; border-collapse: collapse;"> <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>	X	0	1	2	3	4	5	f	142	156	69	27	5	1	06	3	3	2
X	0	1	2	3	4	5													
f	142	156	69	27	5	1													
QVI I b)	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 many students weigh i) Between 120 & 155 lb ii) More than 185 lb	06	3	2	3														
QVI I c)	1. 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	2	1														



Bharatiya Vidya Bhavan's

# SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Murashi Nagar, Andheri (W) Mumbai - 400058



Previous Semester Examinations: December 2022

Program: *S.Y. B.Tech Civil* B.Tech. in Civil Engineering

Duration: 3 Hours

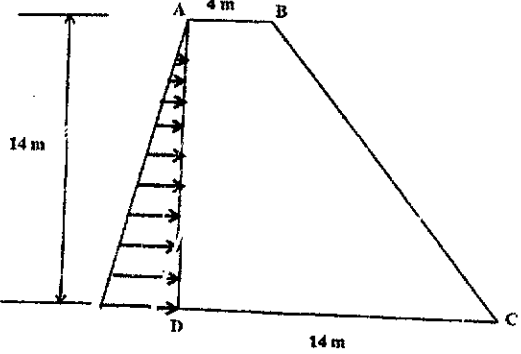
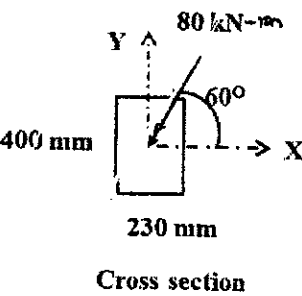
Course Code: PC-B7/C402

Maximum Points: 100

Course Name: Structural Mechanics *old course*

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)	<p>A 14 m high masonry dam of trapezoidal cross section ABCD has the top and bottom widths of 4m and 14m respectively as shown in figure below. The dam retains water on its vertical face to a depth of 14 m. Determine the maximum and minimum stresses developed at the base of the dam. The unit weight of masonry is <math>22 \text{ kN/m}^3</math> and that of water is <math>10 \text{ kN/m}^3</math>.</p> 	10	1	4	1.1.1 1.3.1 2.4.1
Q.1(b)	<p>A rectangular cross section of width 230 mm and depth 400 mm is subjected to a bending moment of 80 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.</p> 	10	1	4	1.1.1 1.3.1 2.4.1

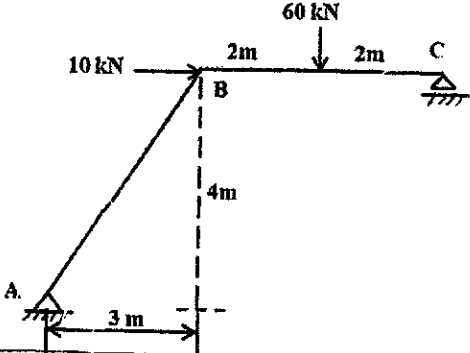
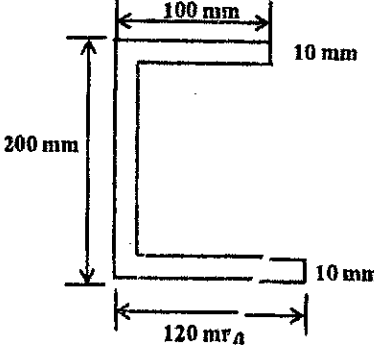


Q.2(a)	State and explain Maxwell's reciprocal theorem.	05	2	2	1.3.1
Q.2(b)	For the frame loaded as shown in figure below a) Find the support reactions b) Draw AFD, SFD & BMD	15	2	3,4	1.3.1 2.1.3
Q.3(a)	Find the slope and vertical deflection at the free end C for the beam supported and loaded as shown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

**Previous Semester Examinations: December 2022**

Q.4(a)	For the pin jointed frame loaded as shown in figure below, find the vertical deflection of joint E.	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 <u>Macaulay's method only</u> , find the slope and vertical deflection at point C 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
Q.6(a)	For the frame loaded as shown in figure below a) Find the support reactions b) Draw AFD, SFD & BMD for member AB only	10	4	3,4	1.1.1 1.3.1 2.4.1



					
Q.6(b)	<p>Compare the crippling loads given by Euler's and Rankine's formulae for a steel column 3.0 m long with one end hinged and the other end fixed. The cross section of the column is a symmetrical I section with the following dimensions:          Top and bottom Flange width = 200 mm,          Top and bottom Flange thickness = 20 mm,          Depth of web = 300 mm, Thickness of web = 30 mm.          Take <math>E = 2 \times 10^5 \text{ N/mm}^2</math>, <math>f_c = 350 \text{ MPa}</math> and Rankine's constant = <math>1/7000</math>.</p>	10	4	3,4	1.1.1 1.3.1 2.4.1
Q.7(a)	<p>(i) Name the methods of finding deflection in trusses.          (ii) State and explain Bette's Law.          (iii) Write the expression for the strain energy stored in a member due to          (a) Bending Moment          (b) Twisting moment          Explain the terms involved in each expression</p>	02	3	2	1.3.1
		04	2	2	1.3.1
		04	4	2	1.3.1
Q.7(b)	<p>Locate the principal axes and find the principal moments of inertia for the angle section shown in figure below.</p>	10	1	3,4	1.1.1 1.3.1 2.4.1
					



Bharatiya Vidya Bhavan's

# Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

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

Previous Semester Examinations, December 2022



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) Write a detailed report of Visit to RMC plant and explain various operations you have observed.	10	3	2	1.2.1
	(b) What do you mean by alkali aggregate reaction.	5	3	4	2.1.2
	(c) State the purpose retarders in RMC.	5	1	2	1.2.1
	a. What are the benefits of GGBS over fly ash?	5	1	3	1.3.2
	b. Design concrete for RCC structures of M25 grade using guidelines given in IS 10262:2019 for the following data.	15	2	2	2.3.1
Q2	Exposure condition: Moderate	Maximum size of aggregate — 20 mm	Method of placement — pumping	Specific gravity of 20 mm aggregate — 2.74	
	Strength of cement OPC — 43 MPa	Workability — slump, 130 mm	Type of coarse aggregate — angular coarse aggregate	Specific gravity of 10 mm aggregate — 2.70	
	Zone of sand — I	Total moisture content in 20, 10 mm — 0.28%	Total moisture content in fine aggregate — 2.6%	Specific gravity of fine aggregate — 2.60	
Q3	(a) State the salient features of High-Performance concrete (HPC) along with its applications?	10	3	4	2.1.2
	(b) What you know about core test? When it is required. Explain in detail the procedure for conducting core 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 self-compacting concrete? How it is different than ordinary concrete?	6	1	2	2.3.1
	(c) Differentiate between super sulphate cement and OPC	4	2	3	1.2.1



Q5	(a) What are the precautions to be taken to deal with concrete to be used in extreme weather condition?	10	1	2	2.1.2
	(b) How high density concrete is made? Where will you recommend high density concrete?	5	1	3	1.3.1
	(c) What are the modifications made in the revised version of concrete design by Road Note No.4 method?	5	2	2	2.3.1
Q6	(a) Enlist and describe in brief the various methods of measuring workability of concrete.	10	1	2	2.3.1
	(b) What type of concrete would you recommend for strengthening the quality of old concrete structures.	5	3	3	1.3.2
	(c) Explain the reaction mechanism of plasticizer with neat sketch.	5	2	3	1.4.1
Q7	Write explanatory notes on the following (any Four)				
	i) Under water concrete	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) Curing of Concrete	5	1	2	1.3.1
	v) Advantages of fly ash in concrete	5	1	2	1.3.1
vi) PC based admixtures	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	2.4	2.6	2.8	3.00
Bulk volume of dry rodded CA/unit volume of concrete for fineness modulus of sand of				
10	0.5	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
15	0.66	0.64	0.62	0.60
19	0.71	0.69	0.67	0.65
25	0.77	0.75	0.73	0.71
37	0.85	0.83	0.81	0.79

(2) Relation between water/cement ratio & average compressive strength of concrete, as per ACI 211.1-91

Average compressive strength at 28 days MPa	Effective water/cement ratio (by mass)	
	Non air entrained concrete	Air entrained concrete
45	0.38	
40	0.45	
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 in contact with water		
(a) Exposed to fresh water	0.5	26
(b) Exposed to sea water	0.45	30
Concrete exposed to freezing & thawing conditions	0.45	30
Exposure condition of 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)
Reinforced 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 ACI 211.1-91

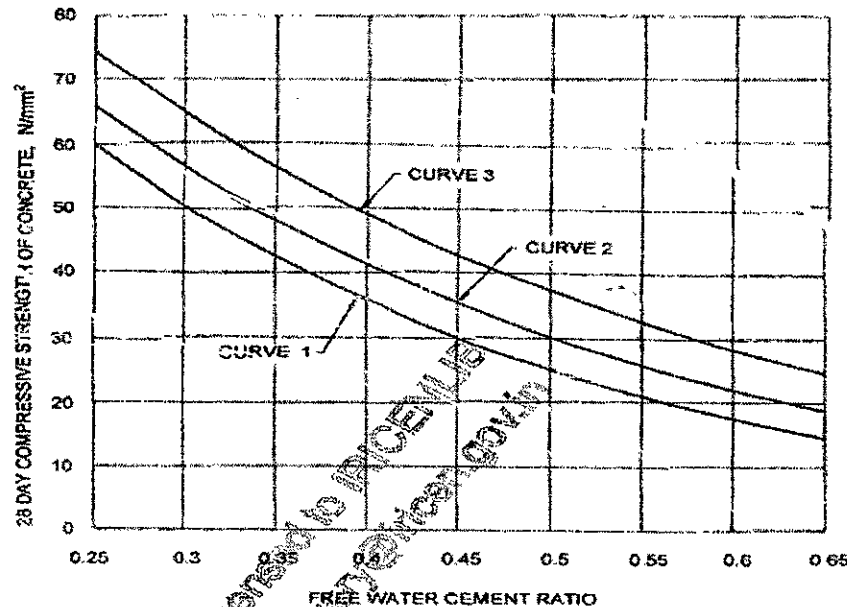
Workability of concrete	Non air entrained concrete			
	Water content, kg/m <sup>3</sup> of concrete for indicated maximum aggregate size	12.5 mm	20 mm	150 mm
30-50 mm slump	(25, 40, 50, 70)			
30-50 mm slump	205	200	195	125
80-100 mm slump	225	215	200	140
150-180 mm slump	240	230	210	160
Approx. entrapped 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 <sup>3</sup>	Air entrained kg/m <sup>3</sup>
10	2285	2190
12.5 (20,25,40,50)	2315	2235
20	2345	2280
150	2505	2435

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

IS 10262 : 2019



Curve 1 : for expected 28 days compressive strength of 33 and < 43 N/mm<sup>2</sup>  
 Curve 2 : for expected 28 days compressive strength of 43 and < 53 N/mm<sup>2</sup>  
 Curve 3 : for expected 28 days compressive strength of 53 N/mm<sup>2</sup> 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/m <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
i)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ii)	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 3.2. 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 pozzolons 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**

- Volumes are based on aggregates in saturated surface dry condition.
- These volumes are for crushed (angular) aggregate and suitable adjustments may be made for other shape of aggregate.
- 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.
- 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 kg
(1)	(2)	(3)
i)	10	208
ii)	20	180
iii)	40	165

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 be adopted during mix proportioning, if the site data (at least 5 results) for similar mix is available.

**End Semester December 2022 Examinations (Previous Semesters)** 29/12/22Program: **B. Tech. Civil Engineering** S. V. D. P. U. G. (Civ) Duration: 3hrs.Course Code: **PE-BTC404** Maximum Points: 100Course 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.

Q.No.	Questions	Points	CO	BL	PI																								
1.	<b>Answer the following:</b>																												
	<ol style="list-style-type: none"> <li>1. Define 'point of tangency' and point of intersection' for a circular curve. (4)</li> <li>2. Give the stadia formula for deriving horizontal distance of a staff station from the instrument station using the tachometric observations. (2)</li> <li>3. Distinguish between:               <ol style="list-style-type: none"> <li>a) theodolite and total station (2)</li> <li>b) theodolite and EDM (2)</li> </ol> </li> <li>4. State different types of curves. (3)</li> <li>5. State atleast 3 applications of tachometric surveying. (3)</li> <li>6. Give the name of any two remote sensing satellites. (2)</li> <li>7. Give the name of any two global positioning systems. (2)</li> </ol>	20	1,2,3	1	1.1.1																								
2.A	<ol style="list-style-type: none"> <li>1. Following are the line levelled tachometry notes taken with an anallatic tachometer with multiplying constant 100. Compute the reduced levels (RLs) of P, Q and R. (6)</li> </ol> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Inst. Station</th> <th>Height of axis</th> <th>Staff stations</th> <th>Vertical Angle</th> <th>Hair readings</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>P</td> <td>1.50</td> <td>B.M.</td> <td>-6° 12'</td> <td>0.963, 1.515, 2.067</td> <td>R.L. of B.M. = 460.650m</td> </tr> <tr> <td>P</td> <td>1.50</td> <td>Q</td> <td>+7° 5'</td> <td>0.819, 1.341, 1.863</td> <td>Staff being held vertically</td> </tr> <tr> <td>Q</td> <td>1.60</td> <td>R</td> <td>+12° 27'</td> <td>1.860, 2.445, 3.030</td> <td></td> </tr> </tbody> </table>	Inst. Station	Height of axis	Staff stations	Vertical Angle	Hair readings	Remarks	P	1.50	B.M.	-6° 12'	0.963, 1.515, 2.067	R.L. of B.M. = 460.650m	P	1.50	Q	+7° 5'	0.819, 1.341, 1.863	Staff being held vertically	Q	1.60	R	+12° 27'	1.860, 2.445, 3.030		14	1,3	3	1.1.2
Inst. Station	Height of axis	Staff stations	Vertical Angle	Hair readings	Remarks																								
P	1.50	B.M.	-6° 12'	0.963, 1.515, 2.067	R.L. of B.M. = 460.650m																								
P	1.50	Q	+7° 5'	0.819, 1.341, 1.863	Staff being held vertically																								
Q	1.60	R	+12° 27'	1.860, 2.445, 3.030																									

**End Semester December 2022 Examinations (Previous Semesters)**

	2. Two tangents intersect at chainage 1190m, the deflection angle being $36^\circ$ . Calculate all the data necessary for setting out a curve with a radius of 300m by offset from chords method, taking the peg interval of 30m. (7)				
2.B	1. Enlist atleast 2 satellite navigation systems. (2) 2. Explain positioning by carrier phase measurements. (4)	6	1,3	1,2	5.1.1
3.A	1. The scale of the photograph is 10cm=100m. The photograph size is 23cm x 23cm. Determine the number of photographs required to cover an area of 15km x 10km, if the longitudinal overlap is 60% and side overlap is 30%. Also, find the spacing of the flight lines. (6) 2. Calculate the aircraft flying height to obtain the average photo scale of 1/7200. Ground surface elevations vary from 160m to 430m. focal length of the camera lens is 153mm. (4) 3. An image of the top hill is 96mm from the principal point of the photograph. The elevation of the top of the hill is 500m and the flying height is 4000m above datum. Calculate the relief displacement. (4)	14	1,3	3	5.1.1
3.B	1. Classify the Electronic Distance Measurement Instrument (EDMI) based on the working range. (3) 2. State the advantages or benefits of using an EDM instead of theodolite. (3)	6	1,3	2	5.1.1
4.A	1. A vertical curve is to be designed connecting two uniform grades of +0.5% and -0.7%. The chainage and the reduced level of the point of intersection are 500m and 330.750m respectively. Take the rate of change of grade as 0.1% per 30m. Calculate: a. Length of the vertical curve. (1) b. Chainage of the tangent points of the curve – beginning point 'O' and ending point 'B'. (2) c. Chainage of the point of intersection 'A'. (1) d. Reduced levels at point O, A, B and at vertex 'F' of the curve. (3) e. Draw proper sketch showing all points O, A, B, and F. (2)	14	1,3	3	1.1.2
4.B	1. Define 'Triangulation'. (2) 2. State the purpose of Triangulation. (2) 3. Give the classification of triangulation methods. (2)	6	2	5.1.1	
5.A	1. State the necessity of curves. (3) 2. State the basic requirements of a tachometer. (3)	6	1,3	2	1.1.2
5.B	For a transition curve: 1. Define 'Super-elevation'. (2)	8	1,3	2	1.1.2

**End Semester December 2022 Examinations (Previous Semesters)**

	2. Explain in short 'Sight-distance'. (2) 3. State the fundamental requirements. (2) State the methods of deciding the length of the curve. (2)				
5.C	Explain how remote elevation measurement (REM) can be done by using a total station.	6	1,3	2	5.1.1
6.A	1. Calculate the frequency of the green light that has a wavelength of $5.5 \times 10^{-7}$ m. (2) [speed of light = $3 \times 10^8$ m/s] 2. Calculate the wavelength of a microwave that has a frequency of $4.2 \times 10^8$ Hz. (2) 3. Define and describe 'Spectral reflectance'. (4)	8	1,3	3	1.1.2
6.B	1. Define 'Baseline'. (1) 2. Explain how you will select a site for Baseline. (3)	4	1,3	1 2	1.1.1
6.C	Explain the method of locating soundings by conning the survey vessel.	4	1,3	2	5.1.1
6.D	State the importance of setting the control points (horizontal and vertical) for establishing the layout of any structure on the ground.	4	1,3	1 2	1.1.1
7.A	A river survey is to be conducted with a view to determine the bed levels by means of soundings. Explain in detail, with proper sketch, how you would carry out the sounding work by the method of two angles from the shore.	10	1,3	1 2	1.1.1
7.B	Explain, with a proper sketch, the method of locating the center line of a bridge by the method of triangulation.	10	1,3	2	5.1.1

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

**PREVIOUS SEMESTER EXAMINATION DECEMBER 2022**

**Program:** S.Y. B. TECH *Sem IV (Civil)*  
**Course Code:** PC-BTC-405  
**Course Name:** HYDRAULIC ENGINEERING

**Duration:** 03 Hrs.  
**Maximum Points:** 100  
**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	Module No.																
1	(a) Explain: hydraulic model testing, laws of similarities, distorted and undistorted models in dimensional analysis and state its importance.	10	4	2	1																
	(b) The ' $\eta$ ' of a fan depends on density ' $\rho$ ' and viscosity of fluid ' $\mu$ ', angular velocity ' $\omega$ ', diameter ' $D$ ' and discharge ' $Q$ '. Obtain a functional relationship for ' $\eta$ ' in terms of dimensionless parameters	10	4	4	1																
2	(a) Derive: Darcy-Weisbach's equation for major loss of head in pipe flow. Explain all terms used	10	1	2	2																
	(b) Explain the phenomenon of water hammer flow in pipelines.	10	1	4	2																
3	(a) Explain with neat sketch working of siphon.	10	1	4	2																
	(b) Three pipes connected in series discharges water from 70 meter level to 40 meter level. The details of piping system are as given below; considering minor losses: determine discharge.	10	1	5	2																
	<table border="1"> <thead> <tr> <th>Pipe</th> <th>Length (m)</th> <th>Diameter (cm)</th> <th>Friction Factor (f)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1100</td> <td>20</td> <td>0.018</td> </tr> <tr> <td>2</td> <td>900</td> <td>10</td> <td>0.022</td> </tr> <tr> <td>3</td> <td>1000</td> <td>15</td> <td>0.020</td> </tr> </tbody> </table>	Pipe	Length (m)	Diameter (cm)	Friction Factor (f)	1	1100	20	0.018	2	900	10	0.022	3	1000	15	0.020				
Pipe	Length (m)	Diameter (cm)	Friction Factor (f)																		
1	1100	20	0.018																		
2	900	10	0.022																		
3	1000	15	0.020																		
4	(a) Explain Impulse Momentum Principle and state its importance in the study of Hydraulic machines.	10	2	2	3																
	(b) A jet of water having velocity ' $V$ ' strikes a single curved vane moving in the same direction as the jet with velocity ' $u$ ', so that the velocity of the jet relative to the vane is $(V-u)$ . The vane causes the jet to be reversed in direction. Show that the maximum efficiency is obtained when $V=3u$ and that this maximum efficiency is slightly less than 60%.	10	2	4	3																
5	(a) Explain with a neat sketch working of a hydroelectric power plant and compare impulse turbine with reaction turbine.	10	2	2	4																
	(b) The penstock supplies water from a reservoir to Pelton wheel with a gross head of 510 m. One third of gross head is lost in friction in penstock. The rate of flow of water through the nozzle is $5 \text{ m}^3/\text{s}$ . The	10	2	4	4																



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**PREVIOUS SEMESTER EXAMINATION DECEMBER 2022**

	angle of direction of jet is $165^\circ$ . Determine power given by water to runner and also hydraulic efficiency of Pelton wheel. Take speed ratio = 0.46 and $C_v = 1.0$ .				
6	(a) What is priming? Why it is required in the centrifugal pump? State its importance.	10	2	2	5
	(b) Explain Characteristics curves for the centrifugal pump. Also explain the importance of the term specific speed ( $N_s$ ).	10	2	3	5
7	(a) Explain: critical, subcritical and supercritical flow in an open channel flow, and explain the specific energy diagram.	10	3	4	6
	(b) Differentiate between gradually varied flow and rapidly varied flow. Also explain Hydraulic jump.	10	3	4	6

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KT- EXAMINATION JAN - 2023

Program: S. Y. B. Tech. Civil - *Sem IV*  
Course Code: PC - BTC - 406  
Course Name: Transportation Engineering

Duration: 3 hours  
Maximum Points: 100  
Semester: IV

(i) Assume suitable data if required

Q.No.	Questions	Points
Q.1.		
a	Discuss suitability of Different mode of transportation.	05
b	Discuss with neat sketch Take off climb surface	05
c	Enumerate the various factors you would like to keep in mind while selecting suitable site for the Airport.	10
Q.2.		
a	What are the assumption made while calculating the basic length of runway?	05
b	Discuss about Airport Drainage system	05
c	The average wind data collected at particular site is given bellow in Table - I. Determine calm period, orientation of runway and wind coverage. Plot wind rose diagram considering direction and total duration. if another runway is oriented at right angle to above runway than what will be the total wind coverage.	10
Q.3.		
a	What is gauge. Discuss different types of gauge	06
b	What do you meant by creep of rail. How to measure it.	06
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.	08
Q.4.		
a	Derive the relationship between supercllevation, speed, Gauge and radius of circular curve. What are its limiting values for different gauges.	10



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**KT- EXAMINATION JAN - 2023**

b	A $6^{\circ}$ curve branches from $4^{\circ}$ main curve in opposite direction in a layout of broad gauge yard. If the speed on branch line is restricted to 25 km/hr. determine the restricted speed on main line.	10
<b>Q.5.</b>		
a	Discuss with sketch of left hand turnout showing important component part of point and crossing.	08
b	Discuss with sketch different types of joints	06
c	How will you decide the location of Exit Taxiway.	06
<b>Q.6.</b>		
a	Explain the term sleeper its function and requirements	06
b	Discuss Classification of station based on operational characteristics.	06
c	Draw a neat sketch of single line railway track in cutting and embankment.	08
<b>Q.7.</b>		
a	Discuss different systems of signaling	06
b	Discuss the requirement of railway station	06
c	Design an exit taxiway joining runway and parallel main taxiway. The total angle of turn is $30^{\circ}$ and turning speed 95 km/hr. draw a neat sketch showing all design elements.	08



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KT- EXAMINATION JAN - 2023

Q.2. (c) Table - I

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



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**Munshi Nagar Andheri (W) Mumbai 400058**

**Previous Semester Examination**  
**December 2022**

3/1/23  
**Duration: 3 Hrs**

**Max. Marks: 100**

**Class: S.Y. B. Tech** *Sem IV Civil*

**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**

Q1	Answer the following Questions	(20)	CO	BL	I												
(a)	A town of Rajkot in Gujarat has a population of 4, 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 all four mathematical methods. <b>Table 1.</b>	(10)	CO1 ,CO 4	4-5	3.												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Year</th> <th>1970</th> <th>1980</th> <th>1990</th> <th>2000</th> <th>2010</th> </tr> </thead> <tbody> <tr> <td>Population</td> <td>1,60,000</td> <td>2,05,000</td> <td>2,70,000</td> <td>3,30,000</td> <td>4,00,000</td> </tr> </tbody> </table>	Year	1970	1980	1990	2000	2010	Population	1,60,000	2,05,000	2,70,000	3,30,000	4,00,000				
Year	1970	1980	1990	2000	2010												
Population	1,60,000	2,05,000	2,70,000	3,30,000	4,00,000												
(b)	As a city engineer of Rajkot city which water demands are to be considered for a growing city. Further enlist the factors affecting rate of demand. Explain the components of Per capita demand in detail	(10)	CO1 , CO2	4-5	3												
<b>Q2</b>	<b>Answer the following questions</b>																
(a)	For the city of Rajkot as mentioned in Q1(a) there are <b>two sources</b> of water <b>surface water source</b> (Canal). <b>Deliberate</b> on the characteristics of water from each source. <b>Draw</b> a flowsheet for the treatment of surface water source. It is found that the hardness level is high around 50 mg/L. Suggest additional units if required. <b>Describe</b> the function of each unit in the flowsheet. <b>Comment</b> on the efficiency of each unit with respect to relevant characteristic/parameter.	(12)	CO1 - CO4	3-5	3												
(b)	Design rapid mix unit for the city of Rajkot for population of 2040 with all checks	(8)	CO1 ,CO 2	3-5	4												
<b>Q3</b>	<b>Answer the following questions</b>	(20)															
(a)	Explain the concept <b>Ideal Settling Tank</b> . <b>Design</b> ideal settling tank for the population for the year 2040 for Rajkot town having average water demand 100 lpcd.	(10)	CO2 - CO4	2-3	2.												

(b)	Lime and soda were used for softening in Rajkot for treatment of following impurities $\text{CaCO}_3 = 70 \text{ mg/L}$ ; $\text{MgSO}_4 = 20 \text{ mg/L}$ ; $\text{NaCl} = 130 \text{ mg/L}$ ; $\text{MgCl}_2 = 20 \text{ mg/L}$ . Compute the quantities of chemicals required for Rajkot in year 2040. Assume soda ash and lime purity 90%. (Consider data in Q1(a)) and water demand as 100lpcd.	(10)	CO2 - CO4	3-4	3.2.1
Q4	Answer any two of the following questions	(20)			
(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 Rajkot 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 Rajkot 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)	Explain lime soda process for hardness removal	(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 chlorination, De- chlorination and super chlorination	(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)	Ion-exchanges	(05)			
(iv)	Iron and Manganese in water and their removal	(05)			
(v)	Jar test	(05)			
Q7	Answer the questions (any 10)	(10)	CO1	1	1.2.1
(i)	Write parameters impacting disinfection				
(ii)	Write parameters impacting sedimentation	(02)			
(iii)	Enumerate filter troubles and give reason for filter troubles	(02)			
(iv)	Write types of intake structures used in water management	(02)			
(v)	Enumerate criteria to decide placement of intake structures	(02)			
(vi)	Explain negative head in filtration	(02)			
(vii)	Enumerate methods for population forecasting	(02)			
(viii)	Enumerate various physical, chemical and biological parameters for water testing	(02)			
(ix)	Enumerate methods for desalination	(02)			
(x)	Enumerate names of coagulants used	(02)			
(xi)	Enumerate the disinfectants	(02)			
(xii)	Enumerate types of Settling tanks	(02)			

**Formula Sheet**

$P_n = P_o \left[ 1 + \frac{r}{100} \right]^n$ $P_n = P_o + nx + \frac{n(n+1)r}{2}$ $\log_e \left[ \frac{P_s - P}{P} \right] - \left[ \frac{P_s - P_o}{P_o} \right] = -k P_s * t$ $P_n = (P_o + n\bar{x})$ $r = \sqrt[r_1 * r_2 * r_3 * \dots * r_n]$	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 <sup>3</sup> /d/m <sup>2</sup> V= 0.849 C R <sup>0.63</sup> S <sup>0.54</sup> SOR= 24-30m <sup>3</sup> /d/m <sup>2</sup> WLR= 200m <sup>3</sup> /m <sup>2</sup> /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 <sup>-1</sup> 0.5 min to 1 min	$P = \frac{1}{2} C_d \rho \cdot A_p \cdot v_r^3$ $C_d = 1.8 \text{ for flat paddles}$ $\rho = 998 \text{ kg/m}^3$ $v_r = (1 - 0.25)v_p$
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 <sup>2</sup> Rate of filtration = 3000-6000l/hr/m <sup>2</sup> Max. demand= 1.8 Q	$v_s = \frac{1}{18} \frac{g}{v} (S_s - 1) * d^2$ <p>Value of <math>v = 1.002 \times 10^{-6} \text{ m}^2/\text{sec}</math></p> $v_d = \sqrt{\left( \frac{8\beta}{f'} \right) (S_s - 1) dg}$ $f' = 0.025 - 0.03$ $g = 9.8 \text{ m/s}^2$	Q/A; Q/ perimeter; Q/b; V/Q $V = D^2(0.011D + 0.785H)$  Rate = 3000-6000litre/hr/m2  $G^2 = P/\mu V = C_d A_p v^3 / 2\mu V$
$G = \sqrt{\frac{P}{\mu * V}}$ $\mu = 1.0087 * 10^{-3} \text{ Ns/m}^2$	$P = F_D * v_r$	$G * t = \frac{v_r}{Q} * \sqrt{\frac{P}{\mu V}} = \frac{\sqrt{PV/\mu}}{Q}$

**ALL THE BEST**



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**PREVIOUS SEM END SEMESTER EXAMINATION, DECEMBER-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: **04/01/2023**  
Duration: **3 Hr.**  
Max. Points: **100**  
Semester: **IV**

**Instructions:**

- Answer ANY FIVE Questions.
- Give suitable illustrative examples to justify your answers wherever necessary.

Q. No.	Question	Points	CO	BL	PI	Module
Q.1	a) Justify: 'India is the richest prize of war' with suitable examples.	(10)	1	VI	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 mankind".	(10)	1	I, VI	6.1.1	2
	b) Justify: "Nature is the supreme teacher (Guru)" describing learnings of Adi yogi Shri Dattatreya from any 03 elements in 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) Justify : Greatness of Indian lifestyle and health care practices since ancient times in context of global pandemic of Covid-19.	(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 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 Mahavir Vardhaman for the entire mankind.	(10)	4	V	6.1.1	7