



Bharatiya Vidya Bhavan's

# SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai - 400058



End Semester Examinations: December 2022

Program: *B.Tech. (Civil) Sem V*  
**B.Tech. in Civil Engineering**

*5/12/2022*  
Duration: 3 Hours

Course Code: PC-BTC 501

Maximum Points: 100

Course Name: **Structural Engineering**

Semester: V

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 symmetrical three hinged parabolic arch of span 60 m and central rise of 10 m is subjected to a udl of 80 kN/m on the left half of the span of the arch. In addition to this, two concentrated loads of 180 kN and 160 kN act on the arch at 12 m and 45 m respectively from the left support. Determine (a) the support reactions (b) radial shear, normal thrust and BM just to the right of 180 kN load (c) radial shear, normal thrust and BM just to the left of 160 kN load (c) draw BMD	15	1	4	1.1.1 1.3.1 2.4.1
Q.1(b)	State the advantages and disadvantages of an arch over a beam of same span.	05	1	2	1.3.1
Q.2(a)	What are the internal forces carried by (i) An arch (ii) A cable (iii)	04	2	2	1.3.1
Q.2(b)	A suspension cable of span 80 m and a central dip of 10 m is supporting a three hinged stiffening girder. The dead load of the girder is 15 kN/m. Two point loads of 220 kN and 280 kN act on the girder at distances of 22 m and 65 m from the left support. (a) Determine the maximum and minimum tension in the cable (b) Draw SFD and BMD for the girder If the suspension cable passes over a smooth pulley on the top of a pier of height 18m and the anchor cable is at 40° to the horizontal, find the forces transmitted to the base of the pier.	16	2	3,4	1.3.1 2.1.3



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**End Semester Examinations: December 2022**

Q.3(a)	<p>A udl of intensity 20 kN/m of length 6m traverses a simply supported beam of span 30 m. Find</p> <p>i) maximum positive SF at a section C, 10 m from left support A.</p> <p>ii) maximum BM at section C, 10 m from left support A.</p> <p>iii) absolute maximum BM anywhere in the beam.</p>	10	2	3,4	1.3.1 2.1.3
Q.3(b)	<p>For the pin jointed frame shown in figure below draw influence diagram for axial force in members FH, FG and EG.</p>	10	2	3,4	1.3.1 2.1.3
Q.4(a)	<p>For the frame shown in figure calculate the horizontal deflection of D due to change in temperature as indicated in figure. Take <math>\alpha = 12 \times 10^{-6}/^{\circ}\text{C}</math> and depth of all members as 400 mm.</p>	12	3	3,4	1.3.1 2.1.3
Q.4(b)	<p>Determine the static and kinematic indeterminacy of the structures shown in figures below.</p>	08	3	3,4	1.3.1 2.1.3
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(i)</p> </div> <div style="text-align: center;"> <p>(ii)</p> </div> </div>					
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(iii)</p> </div> <div style="text-align: center;"> <p>(iv)</p> </div> </div>					

**End Semester Examinations: December 2022**

Q.5(a)	Calculate the flexibility coefficients for the beam shown in figure w.r. to the coordinates indicated in figure.	08	4	3,4	1.1.1 1.3.1 2.4.1
Q.5(b)	Analyse the beam shown in figure by slope deflection method and find the end moments. Support A settles down by 12 mm. $E = 200 \times 10^6 \text{ kN/m}^2$ , $I = 100 \times 10^6 \text{ mm}^4$ .	12	4	3,4	1.1.1 1.3.1 2.4.1
Q.6(a)	Find the reactions at B and C in the continuous beam loaded as shown in figure using the force method.	14	4	3,4	1.1.1 1.3.1 2.4.1
Q.6(b)	How is the information about the degree of static indeterminacy $D_s$ and degree of kinematic indeterminacy $D_k$ useful in the analysis of indeterminate structures?	02	4	2	1.3.1
Q.6(c)	For the structure shown in figures below determine (a) the degree of static external and internal indeterminacy and (b) kinematic indeterminacy considering and neglecting axial deformations.	04	3	3,4	1.3.1 2.1.3



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**End Semester Examinations: December 2022**

Q.7(a)	The members of the truss shown in figure are subjected to temperature increase of $40^{\circ}\text{C}$ . Calculate the vertical deflection of C due to the increase in temperature. Take $\alpha = 12 \times 10^{-6}/^{\circ}\text{C}$ .	12	4	3,4	1.1.1 1.3.1 2.4.1
Q.7(b)	State the important properties of the flexibility matrix.	03	4	2	1.3.1
Q.7(c)	Write a note on the methods of analysis of indeterminate structures.	05	4	2	1.3.1



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End Semester Examinations December 2022

(2022-23)

Program: T.Y. Civil Engineering (UG) *sem V*  
 Course Code: PC-BTC502  
 Course Name: Hydrology and Water Resource Engineering

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

**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 hydrologic cycle and water-budget equation with its applications in Hydrology.	10	1	1	1.2.1																														
	(b) Explain depth area-duration relationships, maximum intensity/depth-duration-frequency relationship and Probable Maximum Precipitation (PMP)	10	1	2	1.3.1																														
2	(a) Discuss evaporation process and explain various types of evaporimeters.	10	1	2	1.2.1																														
	(b) Explain evapotranspiration, interception, depression storage, and state its importance in hydrologic studies.	10	1	2	1.2.1																														
3	(a) Discuss infiltration, infiltration capacity and measurement of infiltration.	10	1	3	1.2.1																														
	(b) Explain factors affecting runoff and discuss methods of runoff estimation.	10	1	3	1.3.1																														
4	(a) What is hydrograph? Explain its components. Also explain Unit hydrograph.	10	1	2																															
	(b) The following data refers to various crops grown under a canal system. Determine the peak discharge of the canal; if time and capacity factors are 0.70 and 0.80 respectively. Also determine the reservoir capacity; if transmission and evaporation losses are 12% and 15% respectively.	10	2	3	2.1.2																														
<table border="1"> <thead> <tr> <th>Crop type</th> <th>Season</th> <th>Duty (Ha/cumecs)</th> <th>Base period (days)</th> <th>Area (Ha)</th> </tr> </thead> <tbody> <tr> <td>Paddy</td> <td>Kharif</td> <td>900</td> <td>180</td> <td>60</td> </tr> <tr> <td>Wheat</td> <td>Kharif</td> <td>1400</td> <td>180</td> <td>30</td> </tr> <tr> <td>Maize</td> <td>Rabi</td> <td>1400</td> <td>120</td> <td>75</td> </tr> <tr> <td>Cotton</td> <td>Hot weather</td> <td>900</td> <td>200</td> <td>40</td> </tr> <tr> <td>Sugarcane</td> <td>Perennial</td> <td>1200</td> <td>365</td> <td>40</td> </tr> </tbody> </table>		Crop type	Season	Duty (Ha/cumecs)	Base period (days)	Area (Ha)	Paddy	Kharif	900	180	60	Wheat	Kharif	1400	180	30	Maize	Rabi	1400	120	75	Cotton	Hot weather	900	200	40	Sugarcane	Perennial	1200	365	40				
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Cotton	Hot weather	900	200	40																															
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5	(a) Explain well hydraulics and define the terms: Permeability,	10	3	3	2.1.2																														



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End Semester Examinations December 2022

(2022-23)

	Transmissibility, Confined aquifer and Unconfined aquifer.				
	(b) An irrigation canal has gross commanded area of 90,000 hectares, out of which 88% is culturable irrigable. The intensity of irrigation for Kharif season is 30% and for Rabi season 60%. Find the discharge required at the head of the canal if the duty at its head is 850 hectares/cumec for Kharif season and 1750 hectares/cumec for Rabi season.	10	2	5	2.1.3
6	(a) Explain with neat sketches various types of earthen dam and discuss its types of failure.	10	4	4	4.1.1
	(b) Design an irrigation channel to carry 55 cumecs, by Kennedy's method. Take $m = 1$ , $B/D = 2.50$ , Manning's $n = 0.0225$ and side slopes $1V: 0.50H$ .	10	4	5	
7	(a) Describe with neat sketches: various forces acting on gravity dam.	10	4	4	4.1.2
	(b) Explain functioning of Spillway as an energy dissipating structures.	10	4	3	6.1.1

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**END SEMESTER EXAMINATION DECEMBER 2022**

Program: T. Y. B. Tech. Civil Engineering *sem V*

Duration: 3 Hrs.

Course Code: PC-BTC503

Maximum Points: 100

Course Name: Soil Mechanics

Semester: V

**Notes:**

1. Question 1 is compulsory.
2. Solve **any four** out of remaining five questions.
3. Each new question must begin on a new page and sub-questions must be grouped together.
4. Please write units everywhere. Marks will be deducted where no or incorrect units are written.
5. Make assumptions where necessary but state them very clearly.

Q. No.	Questions	Points	CO	BL	Module No.
1. a	From the first principles, prove that $n = \frac{e}{1+e}$ where the notations represent standard symbols.	5	1	4	1
b	Sketch a typical compaction curve and explain how moisture content affects the degree of compaction of soil	5	2, 3	3	4
c	During an oedometer test a 2 cm thick sample reached 20% consolidation in 5 mins. At the construction site, determine the time (in days) required for 20% consolidation if the saturated clay layer is 3.75 m thick. Assume double drainage conditions in the field as well as the lab.	5	2, 3	4	6
d	State the limitations of a direct shear test.	5	3	1	7
2. a	Classify the soil as per IS:1498 (1970) based on the following test results: LL = 38%, PL = 18%. If the natural moisture content of this soil in the field is 40%, determine the consistency index and also state if	5	2	4	2



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## END SEMESTER EXAMINATION DECEMBER 2022

		any construction is recommended at the site in its present condition.																				
	b	An earth dam of 12 m height is constructed using soil having cohesion as 26.8 kPa and friction angle of 20 degrees. If the unit weight of the dam is $17 \text{ kN/m}^3$ , determine the factor of safety if stability number obtained from Taylor's charts is 0.11. Is this factor of safety adequate for the proposed dam?	5	3	5	8																
	c	Explain in detail how the SPT test of soil exploration is carried out as per IS:2131 (1981)	10	4	2	9																
3	a	What are isobars? Explain their use in determining depth of soil exploration.	5	3,4	2	5,9																
	b	Explain briefly the factors affecting the coefficient of permeability of soils	5	2	2	3																
	c	An undrained triaxial test was conducted on a sample of silty clay. Determine the long term strength of the soil. Will you consider total stress or effective stress for long term stability?	10	3	5	7																
		<table border="1"> <thead> <tr> <th>Sample</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>Cell pressure (kPa)</td> <td>17</td> <td>44</td> <td>56</td> </tr> <tr> <td>Deviator stress at failure (kPa)</td> <td>140</td> <td>160</td> <td>170</td> </tr> <tr> <td>Pore pressure at failure (kPa)</td> <td>12</td> <td>20</td> <td>22</td> </tr> </tbody> </table>					Sample	1	2	3	Cell pressure (kPa)	17	44	56	Deviator stress at failure (kPa)	140	160	170	Pore pressure at failure (kPa)	12	20	22
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Cell pressure (kPa)	17	44					56															
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Pore pressure at failure (kPa)	12	20	22																			
4	a	Explain Terzaghi's spring analogy with the help of neat sketches.	5	2	2	6																
	b	A dam is constructed on sandy soil. A factor of safety of 5 is required against quick sand condition. As per soil investigations, the porosity of the sand is 42% and specific gravity is 2.65. If the existing upward gradient is 0.25, determine if the dam can be considered as safe.	5	2,3	4	2																
	c	A sand stratum of 12 m thickness has specific gravity of 2.69 and void ratio of 0.68. If the water table is at 1 m below the ground surface and capillary rise is 1m, determine the effective stress at a depth of 8 m below the ground surface. Assume unit weight of water as $10 \text{ kN/m}^3$ .	5	2	4	3																



**END SEMESTER EXAMINATION DECEMBER 2022**

	d	Explain various factors that may cause instability in slopes	5	3	2	8								
5	a	Sketch a typical compaction curve and show a typical ZAV line in reference to that compaction curve. Also denote the optimum moisture content, maximum dry density, wet of optimum and dry of optimum.	5	2	3	4								
	b	For a circular oil tank with diameter 20 m, determine the stress in the soil at a depth of 10 m below the centre of the tank if it carries a load of 1000 kN/m <sup>2</sup>	5	3	3	5								
	c	In an NC clay stratum having thickness of 3 m is placed between two free draining sand strata of 2 m thickness each having saturated unit weight of 20 kN/m <sup>3</sup> . The LL of the clay is 36%, void ratio is 0.82, and saturated unit weight is 19.7 kN/m <sup>3</sup> . If due to construction of a structure, the pressure at the centre of the clay layer increases by 15 kPa, determine the consolidation settlement of the building. Assume GWT at ground surface.	10	3	4	6								
6	a	What are detailed soil investigations? How are they different from preliminary investigations? When are detailed investigations required?	5	4	5	9								
	b	Illustrate with a neat sketch the following: finite slope, infinite slope, base failure of finite slope, toe failure of finite slope and surface failure of finite slope	5	3	3	8								
	c	Following data is collected from a direct shear test on dry sand. Determine the shear parameters graphically. <table border="1"> <thead> <tr> <th>Normal Force (kN)</th> <th>Shear Force (kN)</th> </tr> </thead> <tbody> <tr> <td>45</td> <td>30</td> </tr> <tr> <td>84.6</td> <td>57.6</td> </tr> <tr> <td>124.12</td> <td>85.32</td> </tr> </tbody> </table>	Normal Force (kN)	Shear Force (kN)	45	30	84.6	57.6	124.12	85.32	10	3	4	7
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**END SEMESTER EXAMINATION DECEMBER - 2022**

12/11/22

Program: T. Y. B. Tech. SEM V

Course Code: PC - BTC - 504

Course Name: Highway Engineering

Duration: 3 Hour

Maximum Points: 100

Semester: V

Notes: assume suitable data if required

Q.No.	Questions	Points	CO	Module No.
Q.1.	Solve any four (5x4 =20)	20		
a	Discuss various marking on the roads		3	2
b	Explain the term At grade Intersection		3	2
c	Discuss the Advantages of Rigid Pavements		4	2
d	Lane distribution factor		4	2
e	Vehicle Damage Factor		4	2
Q.2.				
a	Write short notes on (i) Mandatory signs (ii) Informatory sign	06	3	2
b	State the equations for calculation of extra widening on horizontal circular curve.	04	2	1
c	Calculate the extra width of pavement required on horizontal curve of radius 400 m on two lane roads for a design speed of 80 km/hr. The length of wheel base is 6 m. Also calculate the length of transition curve.	10	2	1
Q.3.				



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**END SEMESTER EXAMINATION DECEMBER - 2022**

a	Discuss the Comparison of Flexible and Rigid pavements	05	4	2
b	Discuss the assumptions made in Burmister Layer theory for Flexible Pavement Design.	05	4	2
c	The plate bearing test were conducted using 30 cm diameter plate on subgrade soil and over a base course of thickness 30 cm. the pressure yield at 0.5 cm deflection on subgrade and base course were 1.5 kg/cm <sup>2</sup> and 6 kg/cm <sup>2</sup> respectively. Design the thickness of base course required for a wheel load of 5500 kg with a tyre pressure of 7 kg/cm <sup>2</sup> for an allowable deflection of 0.5 cm using Burmister two layers theory.(Refer Figure 1)	10	4	2
<b>Q.4.</b>				
a	Explain with sketch the various factors controlling alignment of roads.	06	1	1
b	Discuss Importance of subgrade in road construction	06	5	3
c	Design the single lane carriageway flexible pavements passing through plain area for a design life of 15 years. Total numbers of heavy vehicles in both directions for undivided lane carriageway are 700 cvpd, rate of growth of traffic is 7 %, the CBR value of subgrade soil is 6 % and time required for construction of road after last count is 3 years. (Refer Table 1).	08	3	2
<b>Q.5.</b>				
a	How will you carried out fly levelling in field, explain with sketch.	06	1	1
b	Discuss the points to be consider while preparation of detailed project report for road project.	06	1	1
c	Derive the expression for stopping sight distance on levelled alignment. How will you calculate the SSD on sloping alignment?	08	2	1
<b>Q.6.</b>				
a	Discuss the term Prime coat and tack coat	06	5	3



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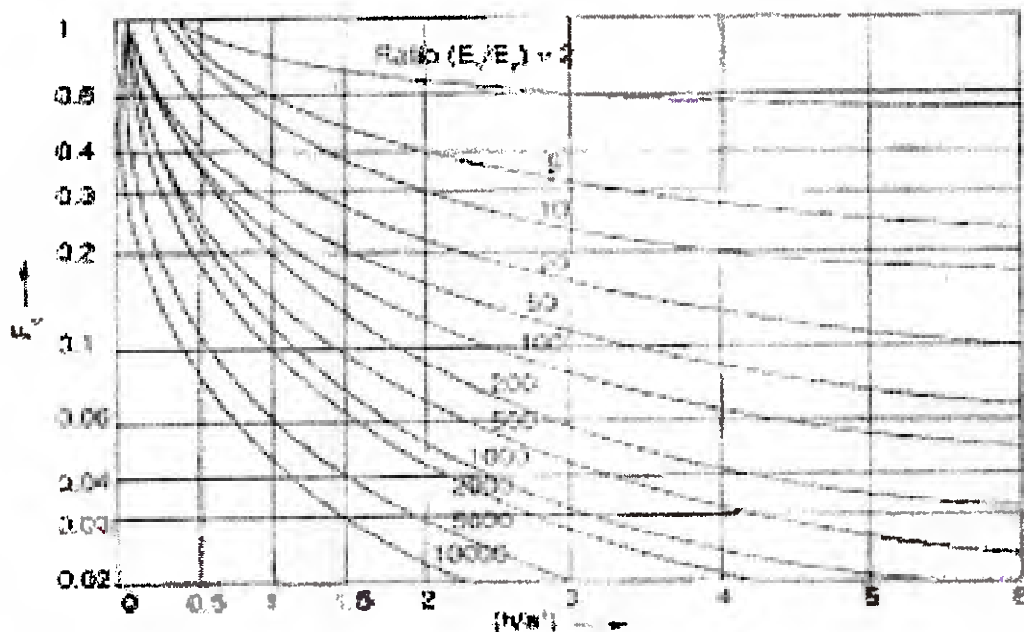
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**END SEMESTER EXAMINATION DECEMBER - 2022**

b	Discuss the Objectives of providing the transition curve. How will you decide the length of transition curve to be provide between straight and circular curve.	06	2	1
c	An ascending gradient of 1 in 25 meet another ascending gradient of 1 in 100, if the height of driver's eyes and height of object above road surface is 1.1 m and 0.20 m respectively. Find the length of summit curve to provide the required sight distance (stopping sight distance) for a design speed of 75 km / hr.	08	2	1
<b>Q.7.</b>				
a	Discuss the different methods of curing of concrete pavements.	06	5	3
b	Discuss the importance of drainage layer in rigid pavement.	06	5	3
c	Explain with neat sketch the steps for construction of cement concrete pavement by alternate bay method and continuous construction method.	08	5	3

Q.3 (c)



**FIG. 7.12** Burrmeister's fine sand system.  $E_1$  as (h/c)



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**END SEMESTER EXAMINATION DECEMBER - 2022**

**Q.4.(c) Table 1.**

CBR %	CSA, msa	Granular subbase (mm)	Granular Base (mm)	Binder course (mm)	Surface Course (mm)	Total Thickness (mm)
6	1	165	225		20 PC	390
	2	175	225	50 BM	20 PC	450
	3	190	250	50 BM	20 PC	490
	5	210	250	50 DBM	25 SDBC	535
	10	260	250	65	40	615
	20			90	40	640
	30			105	40	655
	50			125	40	675
	100			140	50	700
	150			160	50	720



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 Munshi Nagar Andheri (W) Mumbai 400058



**End Semester Exam**  
**Dec 2022**

14/12/22

Duration: 3 Hrs

Semester: V

Program: B. Tech Civil

Max. Marks: 100

Class: TY.B. Tech *sem V*

Name of the Course: Environmental Engineering II

Course Code: BTC 506

**Instructions:**

- Question 1 is compulsory and Attempt any four questions out of the remaining six
- 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:	(10)	CO	BL	PI
(a)	Choose the right choice and give reasons/solutions for the same		2-4	1-4	2.2.1
(A)	A domestic wastewater sewer enters the river. The BOD of the wastewater is 250 mg/L and Flow rate is 1.5 m <sup>3</sup> /sec. The BOD of river at the upstream is 10 mg/L and of 20 m <sup>3</sup> /sec. Find the BOD at the D/S where the Sewer meets the river i) 2.67 m <sup>3</sup> /sec ii) 12 mg/L iii) 26.74 mg/L iv) None of the above	(02)			2.1.1 1.2.2
(B)	BOD/COD ratio of a wastewater sample will usually be _____ and BOD test takes _____ time than COD i) Greater than One, equal ii) Equal to One, more iii) Less than One, more iv) Zero, less	(02)			
(C)	A 100 mL water aliquot was taken to determine total solids. Initial and final weight of crucible was 36 gms and 36.6 gms. A 100 ml of same sample was taken for determining dissolved solids and initial and final weight of crucible was 36 gms and 36.4 gms. What is the content of Total suspended solids in mg/L i) 400 mg/L ii) 26.7 mg/L iii) 200 mg/L iv) None of the above	(02)			
(D)	The average flow in a municipal wastewater treatment plant is 10000 m <sup>3</sup> /day. Determine the approximate diameter of a circular primary clarifier to remove suspended solids at average flow. Assume surface overflow rate of 50 m/day and a depth of 3 m. i) 16m ii) 10 m iii) 26m iv) 20 m	(02)			
(E)	What is the head loss through a bar rack with an approach velocity of 0.60 m/s and velocity through the screen of 1 m/s? i) 46mm ii) 4.6 mm iii) 5.4 mm/sec iv) 0.54 m/s	(02)			

(b)	Explain the concept of Reuse, Reclaim and recycle. Draw a typical flowsheet where wastewater is converted for DIRECT or INDIRECT potable reuse option.	(10)	1-4	1-4	4.3.1 3.1.6
<b>Q2 Answer the following questions:</b>		(20)			
(a)	Enumerate factors to select sewer materials. Rajkot has a population of 6,00,000 (water supply rate is 120 lpcd; sewage conversion factor is 0.75). The drainage area of this area is 20 sq km and run off coefficient is 0.5 on an average. The time of concentration is 30 min, find max runoff using intensity of rainfall as $I = \{900/(t+60)\}$ . This area has a sandy soil and a low water table (1 m depth). Design the sewer line giving checks.	(10)	1-4	1-5	3.1.6 4.3.1
(b)	Explain the need of sewer appurtenances and enumerate the same with explanation of any two with sketches	(10)	3	1-2	1.3.1
<b>Q3 Answer the following questions:</b>		(20)			
(a)	A river named Aji flows in Rajkot and tends to receive untreated sewage from the town. Which tests and why those tests will be done on the river water to check its suitability for drinking purpose	(05)	2	2,3	5.1.2
(b)	The dilution water (CONTROL) has initial DO of 7.5 mg/L and the diluted sample from Aji has DO 7.5 mg/L. The dilution for BOD sample is 1%. After 5 days at 20°C DO in diluted sample falls to 3 mg/L and that of Control is 6.3 mg/L. Find BOD <sub>5</sub> of sample at 20°C. The K <sub>10</sub> value is 0.1/days. Find the BOD of same sample at 27°C at the end of 2 days. $\Theta = 1.056$	(10)	1-3	3-4	4.3.2
(c)	Explain relative stability and population equivalence	(05)	3	1-2	5.1.2
<b>Q4 Answer the following questions:</b>		(20)			
(a)	A design engineer needs to design a wastewater treatment plant for a sewage generating from Rajkot. The domestic wastewater to be treated has initial BOD of 180mg/L and S.S. concentration of 210 mg/L. Find the BOD loading and Suspended solids loading. What will be BOD loading in kg/day assuming 6,00,000 population and 120 lpcd as water supply rate. Illustrate the basic flowsheet of wastewater treatment plant that can be proposed with function of each unit and expected reduction in BOD. Will the efficiency of the plant be as required If the treated wastewater is to be reused as process wastewater for industries, list the additional units required.	(10)	1-4	1-5	5.1.2 4.3.2 3.1.6
(b)	A per capita water demand of an area of Rajkot is 120 LPCD having total population of 60000 persons. The sewage generated from this town is required to lift for 15 m of static head and 120 m distance. Consider loss of head in bends and valves of 0.3 m. Determine (a) size of the sump well, (b) horsepower required for the pump, (c) diameter of the rising main. Assume suitable data required. Assume velocity in rising main as 1m/sec. Take efficiency of pump 65% and motor as 75%.	(10)	3-4	4-5	3.1.6
<b>Q5 Answer any two of the following questions:</b>					
(a)	Explain with short notes (1) Oxidation Ditch (2) Rotating biological contactor(3) Oxidation Pond	(10)	1-2	1	
(b)	In a treatment plant in Rajkot trickling filter is used as the secondary treatment. As a consultant do you think it is better option to opt for trickling filter rather activated sludge process? State advantages and disadvantages	(10)	1-4	1-5	3.1.6

	Determine the size (dia and depth) and numbers of high rate trickling filter to be provided for the following data. (i) Sewage flow = 10 MLD (ii) Recirculation ratio = 1.5; $f=0.8$ (iii) $BOD_5$ of raw sewage = 180 mg/lit (iv) $BOD_5$ removal in PST = 40% (v) Final effluent $BOD_5$ desired = 10 mg/lit Also calculate hydraulic loading and organic loading.				
(c)	In an alternative treatment plant in Rajkot activated sludge treatment is provided as biological treatment. Design a continuous flow completely mixed activated sludge process with following data. Sewage flow 6000 $m^3/d$ ; Influent $BOD = 180 mg/L$ ; Effluent $BOD = 10 mg/L$ , Effluent SS 20; MLSS = 3500 $mg/L$ ; MLVSS/MLSS = 0.8; Return sludge concentration as SS = 15000 $mg/L$ ; $Y = 0.7$ ; $k_d = 0.05 d^{-1}$ ; $\theta_c = 10$ days. Give checks but don't compute oxygen requirement.	(10)	1-4	4-5	3.2.1 3.1.6
<b>Q6</b>	<b>Answer the following questions:</b>	(20)			
(a)	A hostel is provided near Rajkot and has population of 250 residential graduates. Design septic tank with water demand of 200 lpcd. Design trenches (no and size) considering percolation rate as 20 min per cm. Please sketch the same	(10)	3-4	4-5	3.1.6
(b)	For Rajkot, design a conventional digester for mixed primary and activated sludge from 25,000 $m^3/d$ Data given is Raw effluent SS = 250 $mg/L$ SS removal efficiency = 60% SS concentration in primary sludge = 25 $kg/m^3$ Excess activated sludge = 3000 $kg/day$ SS concentration in activated sludge = 10 $kg/m^3$ VM in Mixed sludge = 60%	(10)	3-4	5	3.1.6
<b>Q7</b>	<b>Answer any four the following questions:</b>	(20)			1.3.1
(a)	Problems in activated sludge process	(05)	3-4	1	
(b)	Anaerobic digestion	(05)	2	1	
(c)	Modifications of activated sludge process	(05)	2	1	
(d)	Rain water harvesting	(05)	2	1	
(e)	Laying of sewers	(05)	2	1	



FORMULA SHEET

$V_s = 418(Ss-1)d^2(T+10)/60$

$V_o = 3 \text{ To } 4.5 \sqrt{gd(Ss-1)}$

$v_c = \sqrt{\frac{8\beta g(S_s-1)d}{f}} E_2 - \frac{100}{1 + \frac{0.4432}{1-E_1} \sqrt{\frac{w_2}{VF}}}$

$\cos \frac{\theta}{2} = \left(1 - \frac{2d}{D}\right)$

$I = a/t^n; \quad I = a/(t+b)$

$Y = 0.5\sqrt{B}$

$R = A/P$

$Q = A.V$

$\frac{W_s}{S_s} = \frac{W_f}{S_f} + \frac{W_w}{S_w} \quad Q_w = \frac{VX}{\theta_c X_r}$

$V_s = [0.707(Ss-1)d^{1.6} v^{0.6}]^{0.714}$

$\eta = 1 - \left(1 + \frac{n(v_s)}{Q/A}\right)^{-\frac{1}{n}} \quad q = \frac{Q}{A}$

$BHP = (w.Q.H)/(75.\eta_p.\eta_m)$

$\frac{Q_r}{Q} = \frac{x_t}{\left(\frac{10^6}{SVI} - x_t\right)}$

$\text{Conc } (\mu\text{g}/\text{m}^3) = \frac{\text{ppm} * \text{MW} * 1000}{22.4}$

$\theta_c = \frac{Vx}{(Q+Q_r)x - Q_r x_r}$

$\text{Volume} = \left[ Vf - \frac{2}{3}[V_f - V_d] \right] T_1 + V_d T_2$

$\text{Volume} = \frac{1}{2}[V_f + V_d] T_1 + V_d T_2$

$\frac{1}{\theta_c} = \frac{Q}{V} (1+r-r\frac{X_r}{X})$

$U = \frac{Q(S_o-S)}{V * X}$

$T = \frac{L_a}{20} - 1$

$A = 0.00622.q/V_s; \quad h_L = 0.0729(V^2 - v^2) \quad v = Q/W * d$

$\frac{W_s}{S_s} = \frac{W_f}{S_f} + \frac{W_w}{S_w}$

$Q = C.I.A / 360$

$I = 760 / (t + 10) \quad v = \frac{1}{n} * R^{\frac{2}{3}} * S^{\frac{1}{2}}$

$I = 1020 / (t + 10)$

$V = 0.849 C_H R^{0.63} S^{0.54} \quad \frac{F}{M} = \frac{S}{\theta * X} \quad S_R = 100(1 - 0.605^{1/37})$

$t_o = \frac{d^2(0.011d + 0.785H)}{Q} \quad U = \left(\frac{F}{M}\right) * \left(\frac{E}{100}\right)$

$N_s = \frac{3.65 n_s \sqrt{Q}}{H^{0.33}}$

$E = \left(\frac{S_o - S}{S_o}\right) * 100$

$PE = \frac{\text{BOD load from industry } \left[\frac{\text{kg}}{\text{day}}\right]}{0.054 \left[\frac{\text{kg}}{\text{inhab} \cdot \text{day}}\right]}$

$E_1 = \frac{100}{1 + 0.4432 \sqrt{\frac{w_1}{VF}}}$

$L_t = L_o(10^{-Kt})$

$x = x_a + x_e + x_i$

$V_s = \frac{g(Ss-1)d^2}{18v}$

$\theta_c = \frac{V * x}{Q_w x_w + Q_e x_e}$

$BOD_5 = (DO_{1a} - DO_{5a}) * \text{dilution factor} - (DO_{1b} - DO_{5b})$

$h_c = flv^2 / (2gD)$

$V_{sl} = \frac{W_s}{\gamma_w S_{sl} P_s}$

$U = \frac{Q(S_o-S)}{V * X}$

$O_2 \text{ (g/d)} = Q(S_o - S) - 1.42 Q_w X_r$

$V = \frac{YQ(S_o - S)\theta_c}{x(1 + k_d)\theta_c}$

$\theta_s = \frac{V_s}{Q} \quad \frac{f}{m} = \frac{S_o * Q}{V * X} = \frac{S_o}{\theta * X}$

$y_t = L_o(1 - 10^{-Kt})$

$F = \frac{1+R}{(1+R/10)^2}$

$Q = 130/Vt \text{ (lpd/m}^2\text{)}$

12 to 25 min/cm  
25-50%

0.3-0.6kg/m<sup>3</sup>/d

4-8 hrs	n=0,1/8,1/4,1/2,1	1.8-3m; 1 to 4 m <sup>3</sup> /d/m <sup>2</sup> ; 0.08-0.32kg/m <sup>3</sup> /d
50 - 150 ml/gm	ML= 90 m MW= 30 m L:W= 1.5:1 to 7.5:1 L:D= 5:1 to 25:1 D= 3 to 50 m; 7.5-10% D= 2.5 or 3.5	0.9-2.5m; 10-40m <sup>3</sup> /m <sup>2</sup> /d; 0.32-1 kg/m <sup>3</sup> /d 0.6-1.6kg/d/m <sup>2</sup> 6-35 m 1.6-6.4 kg/d/m <sup>2</sup> 1 in 6 to 1 in 10 10-20 days 1.2 to 2 m 30- 40 days 4.5 to 6 m and maximum 9m 0.9 m <sup>3</sup>
0.7-1.2 m/s	125m <sup>3</sup> /d/m 185m <sup>3</sup> /d/m	0.1 to 0.15per capita with dry solid loading of 80 to 120 kg/m <sup>2</sup> /year 0.2 0.175 -0.2 m <sup>2</sup> /c/yr area or 60-120 kg/m <sup>2</sup> /yr
0.2-0.4/day	25-35 m <sup>3</sup> /m <sup>2</sup> /d; 50-60m <sup>3</sup> /m <sup>2</sup> /d	$Q_{max} = \frac{5Q_w}{P^{0.5}}$ $Q_{max} = \left(1 + \frac{14}{4 + P^{0.5}}\right) Q_{av}$
5-15 days	15-35 m <sup>3</sup> /m <sup>2</sup> /d; 40-50m <sup>3</sup> /m <sup>2</sup> /d	$Q = 10^4 A * I * \frac{Ri}{1000 * 3600}$



Bharatiya Vidya Bhavan's  
**Sardar Patel College of Engineering**  
 (A Government Aided Autonomous Institute)  
 Munshi Nagar, Andheri (West), Mumbai – 400058.



**End Semester Exam**  
**December 2022**

16/12/22

Max. Marks: 100

Duration: 3 Hours

Class: T.Y Civil

Semester: V

Program: ~~B.Tech Civil~~

**Organizational Communication and Interpersonal Skills**

Course Code : HSM BTC 507

**Note:**

- Q.1. is Compulsory
- Out of remaining 6 questions attempt any 4
- Each question carries 20 marks
- Start every question from fresh page.

Q.No	Answer the following questions:	Grade points	CO	BL	PI
Q.1	<p>Your college is planning to form few technical and non- technical clubs for students. The Student Welfare Committee Chairperson has assigned you the responsibility to discuss with your faculty, Industry personals, Alumni, classmates; CR's of all the branches and submits a detailed report on the type of clubs and the nature of activities they will take up. Present the entire report with recommendations in Memo Format in capacity of General Secretary.</p> <p><b>Apply at least 4 procedures to acquire data.</b></p>	20 05 + 15 Format & Content	03	04	10.1.3
Q.2	<p>Apply for the position offered by "Shine International groups' ltd'..</p> <p>Write a cover letter and a detailed Resume for the job position given below. ( Invent necessary details)</p> <p>Selected Engineer's Day-to-day Responsibilities Include</p> <ul style="list-style-type: none"> <li>• Execution Planning of all the site civil related works - Earthwork / Civil work/ Footing Foundations, /JCB/ Dozers, etc.,</li> <li>• Ensuring the quality of construction Materials</li> <li>• Project work scheduling and maintaining the project Deadlines</li> <li>• Project execution co-ordination with Consultants, Surveyors, Vendors, Management, etc.,</li> <li>• Responsible for inventory storage of materials on the site.</li> <li>• Preparing daily reports on closing stocks, labor attendance tasks done, etc.</li> </ul>	20 05+ 15 Cover letter & Resume	02	04	10.1.1

	<ul style="list-style-type: none"> <li>• Weekly submission of bill book, petty cash accounts with respect to the site works.</li> <li>• To receive materials submit necessary documents for the same.</li> <li>• Fix Agenda for review meetings, etc.</li> </ul> <p>Desired Candidate Profile • B.Tech in Civil engineering • 0- 2 years of Experience as a Civil/Site Engineer</p> <ul style="list-style-type: none"> <li>• Intermediate knowledge required on AutoCAD, GIS and MS office</li> </ul> <p>Role Construction-Construction Management Industry Type Engineering Construction Functional Area Site Engineering, Project Management Employment Type Full Time, Permanent Role Category Site Engineering Education UG : B.Tech /B.E. in Civil</p>				
Q.3	<p>The All-India Council of Technical Education has appointed a ten-member committee to study the quality of technical education in the country and its relevance to the social needs and national requirements under NEP 2020. In its 8th Meeting held at 4 p.m. on 25 November, 2022 at Manikchand Bhavan, Netaji Marg, New Delhi-110006 this committee transacted the following business:</p> <ol style="list-style-type: none"> <li>1. Confirmation of minutes of the previous meeting</li> <li>2. Revision of courses with reference to Industry 5.0</li> <li>3. Identification of the points Like lab facilities, Equipment, Course, on which information to be sought from institutions</li> <li>4. Provision of compulsory internships to be provided to third year students</li> <li>5. Constitution of four sub-committees for personal interaction with engineering colleges</li> <li>6. Selection of courses across branches</li> <li>7. Any other matter with the permission of the chairman.</li> <li>8. Date for the next meeting</li> </ol> <p>Assuming you to be the secretary of the review committee, Draft the Notice, Agenda, and Minutes for the above meeting.</p>	20  06+ 16	01	01	10.3.1
Q.4	<p>A. As the student of third year civil branch draft an email to OCIS faculty informing about the progress of your book report and briefly describing the summary of the report. Keep the Principal in CC and Dean Academics in BCC.</p> <p>B. Your friend is new to professional email writing. Explain in detail the do's and don'ts of an email.</p>	12 + 08	04	03	12.1.1
Q.5	<p>Tarun had to select a suitable candidate from a pool of applicants for the post of research and training associate. He shortlisted seven applicants and called them for GD. The GD was a chaos. The participants argued with one another unnecessarily and displayed poor listening skills. There were disagreements on virtually every point, and some participants held parallel</p>	20 10+10	02	01	10.3.2

conversations. The GD overshot the time allotted and did not reach any conclusion. Despite the chaos, Tarun could mentally figure out two candidates Sadhana and Asha-were better than the others and were superior in terms of ideas they had to offer. Sadhana and Asha were called for a first interview before interviews with the HR team. Since the post required persons who were relatively fresher's, Tarun prepared to ask four questions.

This was how Sadhana's interview went:

Question1: Tell me something about yourself.

"Hi, sir. I am Sadhana from Bangalore and currently just out of college. 15 05 02 I have done my graduation in commerce from ABC college with 67 percent marks and have done most of my studies from Bangalore. I have participated in many cultural activities and organized college events. My parents hail from New Delhi, although we have settled in Bangalore for more than 15 years now. They are both employed in government service. As far as my interest goes. I love to play Badminton and hockey. I am fond of watching TV and movies in particular. Although the marks I have got throughout school and college have been in first class, I could not focus much due to my illness. During my school and college days I participated in many events and organized events.

Question 02. Why do you think you qualify for this job?

'Sir, I am a very passionate trainer and am able to communicate to people very clearly. Training is something which is very close to my heart. I have taught many people, mostly at home, and I find that this is the only career that I am interested in. I am now singularly focused upon building my career in the field of training. Also, the post, I believe, is based out of Bangalore, and it is also a good enough reason for me to apply, as I would get a chance to stay close to my family.'

Question 03. What do you know about the nature of training and development we provide?

'Sir, I am not aware of the training and development your company provides. But what I gathered from other sources is that you have a training center for employees at Gurgaon and a research center at New Delhi.'

Question 4. Do you have something to ask?

Sir. May I ask you, what would be the remuneration for the position I have applied for?

This is how Asha's interview went:

Question 1. Tell me something about yourself.

'I am from Hyderabad and have currently completed my final year of graduation and I am waiting the results. I have scored more than 70 percent throughout my career. I have been a good performer at the college and school levels. Apart from this, I have participated in many extracurricular activities, both at the school and at the college and have a couple of accolades, which are listed in my resume. Throughout my career I have financed my own education

	<p>from the fee that I earned by assisting and nurturing students recognize their own potential. I have also provided career counselling to many students and found my interest in that field.</p> <p>Question 2. Why do you think you qualify for this job?</p> <p>'As I mentioned, I self-financed my studies and have provided training and coaching to many students. I have also provided career counselling, which has helped me to realize my potential. Moreover, my performance in my examinations has demonstrated my capabilities as a student and my ability to advance the cause of education and training. Although I have professionally not done any research, I have been involved with my faculty in helping them with their research work. The work done by my faculty members has been published in international journals, and I have been credited for the work that I have done. I feel that this is an area which interests me and I would be interested in doing more of research.'</p> <p>Question 03. What do you know about the nature of training and development we provide?</p> <p>'Sir, your company is one of the leading providers of training and education to its employees. It is also globally renowned for its ability to leverage the expertise of providing cutting-edge knowledge to its employees. The investment in training in your company has been growing over the years, which can be easily seen in the company reports. The company feels that employees can deliver better and provide improved services if they are kept updated about the best and the most recent practices. The above has been mentioned by the CEO in the recent Indian Leader Summit. The Globe award which you have received validates the company's capability to further the cause of training.'</p> <p>Question 4. Do you have something to ask?</p> <p>'What are your expectations from the candidates that you select?</p> <p>Asha leaves, thanking Tarun for his time and for giving her an opportunity to be interviewed. Tarun now has to choose between the two candidates. He records his comments and sends a report to HR team.</p> <p><b>QUESTIONS:</b></p> <p>1. Who do you think is a better candidate? What makes the candidate stand out?</p> <p>2. What were the mistakes made by the candidate who is inferior to the other? How could she have done better?</p>				
<b>Q.6</b>	Jyothi's concepts are clear and her reasoning is sound, but in the feedback to her presentations, the audience often says that she is very feeble. You just cannot hear her beyond the first two rows.	20	04	05	10.3.1

	<p>She has also not made her PowerPoint slides properly. You want to see Jyothi improve the quality of delivery of her presentations, as you feel this is a critical skill needed going forward. What suggestions would you give her regarding Content, Visual Aids, Delivery and Speaking Skills, Body language and Attire?</p>				
<p><b>Q.7</b></p>	<p><b>Saminder</b>, a fresh graduate, joined an Indian IIT firm. On the first day in the office, he wanted to be his natural self. So, he wore a pair of jeans and shirt and walked into the office. He got to meet his boss, and the first question the latter asked him was, 'Did you not find out about the dress code we follow?' Saminder was perplexed. After all, he was under the impression that IT companies had a 'casual' work environment.</p> <p>He was assigned a project, and after some training, was able to give his best. He interacted with his teammates and his clients, and was happy that he was doing a good job. A year passed by and it was time for his performance discussion. There was shocking news in the store for him at the discussion: He was rated 'one of the lowest' performer in the team. He was furious and walked into the manger's cubicle.</p> <p>This is what Saminder's manager told him: 'You are diligent at work, but apart from the good work you do, there are some unwritten rules of the organisation that you must follow. I am being very open as I want you to grow in this company. Here, people liked to be addressed as 'sir' or 'madam' and by their first names. However, you do not follow this practice. Calling people by their first name is offensive in this company.'</p> <p>Saminder 's manager once again touched upon the issue of the dress code. He said: 'You are expected to wear formals on all the days except Friday. Often, I see you coming to the office unshaven, shirt untucked, and wearing jazzy colours. This kind of dressing does not go well with the culture of the company. Moreover, you often come late and work late, which disturbs the working schedule of the other team members. Here, employees are expected to come on time and leave on time.'</p> <p>Saminder's manager asked him whether he remembered what happened during a visit to their office by clients, when Saminder had been asked to come to work in formal attire. 'You disrespected that request of ours,' the manager reminded Saminder. 'Moreover, on the same occasion, in spite of telling you multiple times, you spoke in Hindi in front of your clients knowing well that they understand only English. In the same meeting, your phone rang twice, to which they objected. The impression that you created among them was not good, and they refused to involve in the project. However, in spite of this, we have requested them to keep you, owing to the work that you did.' Saminder's manager also reminded him that at the dinner hosted by the clients, Saminder drank so much that he lost his senses. 'You made a lot of noise while you were eating, and were busy grabbing food instead of focusing on the interaction with the clients.'</p> <p>Saminder was also told that many of his colleagues had complained that he spoke loudly on the phone while in his cubicle.</p>	<p>20 10 + 10</p>	<p>04</p>	<p>05</p>	<p>12.1.2</p>

'When you pick up your mobile phone, you go to a private space. This has caused lot of problem to people around you.' The manager said.

The manager said that when Saminder attended conference calls with clients, irrespective of what was being discussed. He kept the phone at high volume. 'While talking, you are loud, and during informal, friendly conversations, your uses of slang and abuses have been noticed by many. You have discussed politics and got into fight with your colleagues on many occasions.'

The manager reminded Saminder that the day he joined, he had been told about the appropriate conduct expected from him. He told Saminder: 'I told you about the dress codes we follow and our work culture .Saminder you have been found sleeping after the lunch hour on your table. During office hours, many senior managers have noticed you with a novel in hand, which definitely does not give them the right picture about you.'

'A couple of your women colleagues have complained that you have been rude to them. You have forwarded them emails and messages that have offended them, 'Saminder's manager told him. He added: 'Reminder that doing well in your job is not enough. The professional space is also about how you carry yourself.'

**Question**

- 1. On what fronts did Saminder violate the etiquettes? List the etiquettes that he did not follow.**
- 2. Should he resign or take this situation as a challenge to correct it? Explain what steps should Saminder take to improve his image in front of his colleagues**