Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

End Semester-Examination - June 2024

Program: S.Y.B.Tech (Civil) **Duration: 3 Hours** 7/6/24

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

Course Name: Probability, Statistics and Operation Research **Semester: IV**

Note:

1. **Attempt Any Five Questions**
2. **Answers to the sub questions should be grouped together**

		Questions	Points	CO	BL	Module
1	a	Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one girl (iii) at most two boys? Assume equal probability for boys and girls.	6	CO1	BL5	2
	b	The equations of the lines of regression are $3x+2y=26$ and $6x+y=31$ Find $\bar{x}, \bar{y}$ and r. Also, find the variance of y if the variance of x is 25.	6	CO1	BL5	1
	c	Find Mean and Variance of Poisson Distribution	8	CO1	BL3	2
2	a	The mean height and the S.D of the height of eight randomly chosen soldiers are 166.9 cm and 8.29 cm respectively. The corresponding values of six randomly chosen sailors are 170.3 cm and 8.50 cm respectively. Based on this data, can we conclude that soldiers are, in general, shorter than sailors?	6	CO2	BL5	4
	b	If θ is the acute angle between the two regression lines, then prove that $\tan\theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$, where r, σ_x, σ_y have their usual meanings.	6	CO1	BL2	1
	c	Given the following information about the marks of 60 students Mathematics: Mean 80, Standard Deviation 15 Physics: Mean 50, Standard Deviation 10	8	CO1	BL3	5

End Semester-Examination - June 2024

		Correlation coefficient = 0.4 Estimate (i) The marks of a student in mathematics who scored 60 in physics (ii) The marks of a student in physics who scored 70 in mathematics.				
3	a	An automatic machine makes paper clip from coils of wire. On an average 1 in 400 clips is defective. If the paperclips are packed in boxes of 100, what is the probability that any given box of clips will contain (i) no defective (ii) one or more defective (iii) less than two defective clips?	6	CO1	BL4	2
	b	A potential buyer of light bulbs bought 50 bulbs each of 2 brands. Upon testing the bulbs, he found that brand A had a mean life of 1282 hours with S.D of 80 hours, brand B had a mean life of 1208 hours with S.D of 94 hours. Can the buyer be quite certain that the mean of the two brands differ?	6	CO2	BL5	1
	c	In the usual notation, prove the Spearman's formula for Rank correlation $R = 1 - \frac{6}{n(n^2-1)} \sum_{i=1}^{n} d_i^2$, where $d_i = x_i - y_i$	8	CO1	BL5	1
4	a	Compute spearman's rank correlation coefficient for the following data	6	CO1	BL5	1
	b	An aptitude test for selecting officers in a bank is conducted on 1000 candidates. The average score is 42 and standard deviation of score is 24. Assuming normal distribution for the scores, find (i) The numbers of candidates whose scores exceed 60.	6	CO2	BL3	5

X	36	56	20	42	33	44	50	15	60
Y	50	35	70	58	75	60	45	80	38

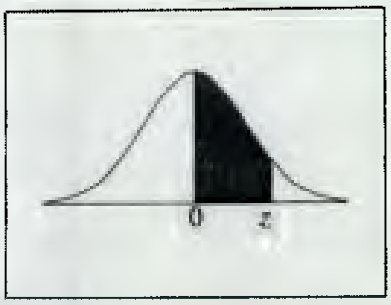
End Semester-Examination - June 2024

		(ii) The numbers of candidates whose score lie between 30 and 60.				
	c	Find constant k such that the function $f(x)=\begin{cases}k(1-x^2), & \text{if } 0\le x\le 1\\ 0 & \text{elsewhere}\end{cases}$ is a density function. Also find $P(0.1\le X\le 0.2)$ and $P(X\ge 0.5)$	8	CO1	BL3	1
5	a	Certain pesticide is packed into bags by a machine. A random sample of 10 bags is drawn and their contents are found to weigh (in kg) as follows 50, 49, 52, 44, 45, 48, 46, 45, 49, 45 Test if average packing can be taken to be 50 kg at 5% LOS.	6	CO2	BL4,5	3
	b	A random variable takes values 1, 2, 3, 4 such that $2\cdot P(X=1) = 3\cdot P(X=2) = P(X=3) = 5\cdot P(X=4)$, find the Probability Distribution, Mean and Variance.	6	CO1	BL4	2
	c	Calculate the correlation coefficient between x and y from the following data $n=10$, $\sum x=140$, $\sum y=150$, $\sum(x-10)^2=180$, $\sum(y-15)^2=215$, $\sum(x-10)(y-15)=60$.	8	CO1	BL2, BL4	1
6	a	In a binomial distribution with six independent trials, the probability of 3 and 4 successes is found to be 0.2457 and 0.0819 respectively. Find the parameters p and q of the binomial distribution.	5	CO1	BL5	2
	b	A machine is set to produce metal plates of thickness 1.5 cms with standard deviation 0.2 cm. A sample of 100 plates produced by the machine gave an average thickness of 1.2 cms. Is the machine fulfilling the purpose?	5	CO2	BL3	4

End Semester-Examination - June 2024

	c	Solve the following LPP using Big M Method Minimize $Z = 2x + 3y$ Subject to $x + y \geq 5, \quad x + 2y \geq 6, \quad x, y \geq 0$	10	CO3	BL3, BL5	5
7	a	Two random sample gave the following data Sample No | Size | Mean | Variance 1 | 1500 | 67.42 | 2.58 2 | 2000 | 67.25 | 2.5 Is the difference between standard deviation significant?	5	CO2	BL2, BL3	4
	b	The marks obtained by students in a certain examination follow a normal distribution with mean 45 and standard deviation 10. If 1000 students appeared at an examination, calculate the number of students scoring (i) less than 40 marks (ii) more than 60 marks.	5	CO1	BL5	3
	c	Solve the following LPP using Simplex Method Maximize $Z = 3x + 2y + 5z$ Subject to $x + 2y + z \leq 430, \quad 3x + 2z \leq 460, \quad x + 4y \leq 420, \quad x, y, z \geq 0$	10	CO3	BL1, BL3	5

Standard Normal Distribution Table

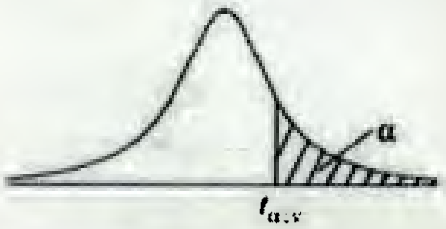


z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.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	.2704	.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	.4515	.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	.4881	.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	.4960	.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
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998

Gilles Cazelais. Typeset with LaTeX on April 20, 2006.

Table of the Student's *t*-distribution

The table gives the values of $t_{\alpha,\nu}$ where
$\Pr(T_\nu > t_{\alpha,\nu}) = \alpha$, with ν degrees of freedom



ν \ α	0.1	0.05	0.025	0.01	0.005	0.001	0.0005
1	3.078	6.314	12.076	31.821	63.657	318.310	636.620
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

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

End Semester Examination
June 2024

11/6/24

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

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

Name of the Course: Environmental Engineering I **Program:** B. Tech Civil

Course Code: BTC407

Instructions:

Question 1 is compulsory. Attempt any four questions out of remaining six

Draw neat sketches/ diagrams wherever required, summary of design should be mentioned

Assume suitable data if necessary and state them clearly

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

Q1	**Answer the following Questions**	(20)	CO	BL
(a)	Explain the visit to Bhandup Water Treatment Plant with the flowsheet of the same. Provide details of sources of water and amount of water treated, the coagulants used, demand considered, the treatment flowsheet adopted with details and explanations of units and the amount in reductions at each stage.	(10)	CO1-CO4	3
(b)	Select the closest answers and show calculations for following questions :	(10)	CO3	3
i	The surface loading rate ($m^3/m^2/d$) of 4 tanks with Length= 40 m , width= 8 m and height 3 m with a flow of 30 MLD is (i) $46.87 m^3/d/m^2$ (ii) $93.75 m^3/d$ (iii)$250 m^3/d/m^2$(iv) $23.43 m^3/d/m^2$	(03)		
ii	The quantity of 85% pure alum required (per year in kgs) for treating 60 MLD of water if alum required is 30 mg/L (i) 657.9 kg/year (ii) 772.9 kg/yr (ii) $7.73*10^5$kg/yr (iv) $6.57*10^5$kg/yr	(03)		
iii	Calculate lime and soda ash required to remove 138 mg/L of $MgCl_2$ (i) 49.2 mg/L; 66 mg/L (ii) 107 mg/L, 153.9 mg/L (iii) 35.5 mg/L, 106 mg/L (iv) 162 mg/L, 109 mg/L	(04)		
Q2	**Answer the following questions**	(20)		
(a)	**Classify water quality parameters. Enumerate sources and effects of water pollutants (atleast six to seven).** A story in TOI on 6th May stated Notices were sent recently after the civic body observed poor quality of water. The Chief officer of Municipal corporation of Alandi, Pune Sunil Bhumkar said, "Oxygen level in the drinking water drawn from the river has reduced drastically due to the high level of hyacinth in the river. Therefore, we advised people to boil the water to avoid health issues." **Is this statement correct as per your knowledge? Explain the actual need to boil**	(10)	CO1	3, 4

	the water? (There are several factories in nearby areas in Alandi and residential area too)			
(b)	There are few industries and less development in **rural areas of India**. Explain this question with respect to water supply schemes	**(05)**	**CO1**	
(c)	Explain **the urban water supply systems with respect to design, design life and basic institutional arrangement and design guidelines.**	**(05)**	**CO1**	**4**
Q3	**Answer the following questions**	**(20)**		
(a)	A **bell mouth canal intake is to be designed for Ranikhet** considering population of 6,00,000 and water demand of 130 lpcd (a) drawing water from a canal which runs for 9 hrs a day with a depth of 2 m. Calculate head loss in intake conduit if treatment works are 0.75 km away. Consumption of the town is to be considered 130 lpcd. Assume velocity through screens and bell mouth to be less than 16cm/sec and 32 m/sec. Also draw a neat sketch of design. **$v=0.85\ C_H R^{0.63} S^{0.54}$ (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)**	**(10)**	**CO2**	**4**
(b)	In continuous flow settling tank 3.5 m deep and 70 m long, what is flow velocity of water that you would recommend for effective removal of 0.03 mm particles at 25°C. The specific gravity of particles is 2.65 and γ is 0.01 cm^2/sec. Check scour velocity too if Beta is 0.04 and friction factor is 0.03. Take 50 cm free board (actual H=3 m)	**(10)**	**CO1**	
Q4	**Answer the following questions**	**(20)**		
(a)	You are an engineer at the Ranikhet Municipal Council, located in the town of Ranikhet (Uttarakhand). Your responsibility is to plan and design a water distribution network for a greenfield project in the region. Explain steps with figures and steps in detail how would you use QGIS, JalTantra, and EPANET to create an efficient water distribution system	**(10)**	**CO4**	**4**
(b)	Design a mechanical rapid mix unit for a design flow to be treated as 500 m^3/hr. Take value of μ as 1.0087E-03Ns/m^2 . Assume DT find volume. Find depth and diameter. Compute power requirements	**(5)**	**CO2**	**2**
(c)	Explain with short notes (i) Ion Exchange (ii) Coagulants	**(5)**	**CO3**	**2**
Q5	**Answer the following questions**	**(20)**		
(a)	Explain the concept **Ideal Settling Tank in depth. Design ideal** settling tank for the population of 6,00,000 for Ranikhet town having average water demand **130 lpcd.**	**(10)**	**CO2**	**2-3**
(b)	Explain coagulation and flocculation. Design water depth for a slow mixing basin (gravity flocculator) having around the end baffles in order to treat 90 MLD. Tank is divided in two compartments by providing longitudinal partition wall and each half has a width of 10 m. Assume suitable detention times and flow velocities. Clear distance between baffles may be kept min permissible. Mention number of channels and overall length.	**(10)**	**CO2**	**3-4**
Q6	**Answer 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 of 6,00,000 for Ranikhet town having water demand **130 lpcd. Design wash water system too**	**(15)**	**CO3**	**3-5**
(b)	Explain factors affecting disinfectant use and dose. Enlist disinfectants used in water treatment. Draw the graph of chlorine utilization. Find chlorine consumed in kg/day and chlorine dosage in mg/L for the city of Ranikhet in if the residual chlorine **is 0.2 mg/L** and a **chlorine demand is 1.1 mg/L and average water demand of 130 lpcd and population 6,00,000.**	**(05)**	**CO3,CO4**	**2-4**
Q7	**Give solutions to the following problems encountered in India**	**(20)**		
(a)	The content of fluoride is 7 mg/L. What are the typical values expected for drinking water and what are the implications? Explain how the problem can be solved for a remote village in India.	**(05)**		
(b)	It was observed that very high odor and color is visible in one of the sources in remote village in Maharashtra. How this problem could be solved in the village. Explain the processes that can be adopted for the same	**(05)**		
(c)	A rural well is to be disinfected. Explain the process for the same in detail	**(05)**		
(d)	In a far flung small town in India the only water available in sea water and ground water also has high amount of salt ingress. Which technique can be used in this town for generating drinkable water. Explain in detail with figures	**(05)**		

Formula Sheet

$P_n = P_o\left[1+\frac{r}{100}\right]^n$ $P_n = P_o + nx + \frac{n(n+1)}{2}y$ $\log_e\left[\frac{P_s - P}{P}\right] - \left[\frac{P_s - P_o}{P_o}\right] = -kP_s * t$ $P_n = (P_o + n\bar{x})$ $r = \sqrt[n]{r_1 * r_2 * r_3 * \ldots\ldots * r_n}$	Al=27; Ca=40; C=12; O=16; S=32; Cl=35.5; H=1; Na=23; Fe= 55.5; Mg=24; Si=14 $G = \sqrt{\frac{P}{\mu * V}}$ μ=1.0087*10^{-3}Ns/m^2	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 $^{0.54}$ Leq = L_{50} +{ (L_{10} - L_{90})^2 / 60} NC = L_{10} - L_{90} SOR= 24-30m^3/d/m^2 SA=volume/SOR G =300-700s^{-1} 0.5 min to 1 min
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	$v_s = \frac{1}{18}\frac{g}{v}(S_s - 1) * d^2$ Value of u=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) Entire filter area Area of manifold= 1.5 to 2 times laterals Rate of filtration = 300 to 5001/hr/m^2 Rate of filtration = 3000-60001/hr/m^2 Max. demand= 1.8 Q $G * t = \frac{V}{Q} * \sqrt{\frac{P}{\mu V}} = \frac{\sqrt{PV/\mu}}{Q}$

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations: June 2024

13/6/24

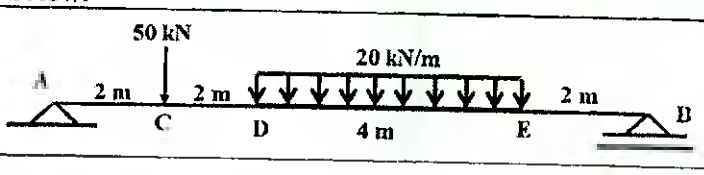
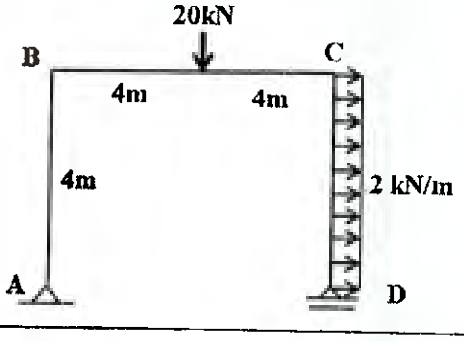
S. Y.

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	Module
Q.1(a)	**A masonry chimney of hollow circular cross section is of height 6m. It has an external diameter of 2m and internal diameter of 1.5m. It is subjected to a horizontal wind pressure of 1.6 kN/m^2. Determine** **(i) the total wind force acting on the chimney.** **(ii) the bending moment at the base of the chimney due to wind pressure.** **(iii) maximum and minimum stresses developed at the base of the chimney.** **The unit weight of masonry is 20 kN/m^3.**	10	1	4	1
Q.1(b)	**Using Macaulay's method only, find the slope at and vertical deflection at D for the beam supported and loaded as shown in figure below.**	10	3	3,4	5
					
Q.2(a)	**State and explain Bette's theorem.**	05	2	2	4
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	3
					

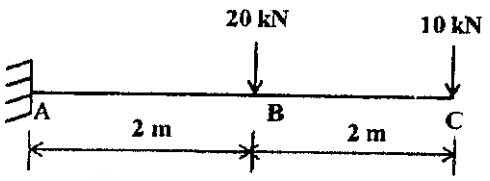
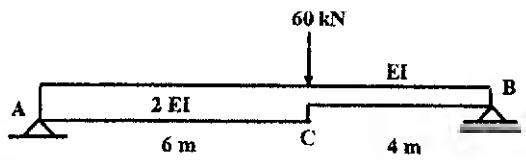
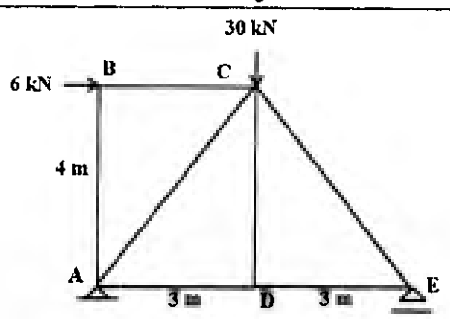
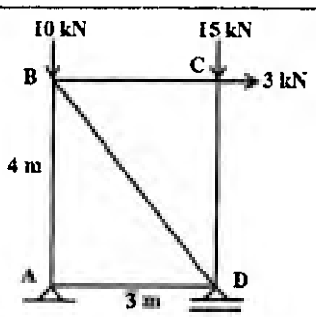
Bharatiya Vidya Bhavan's

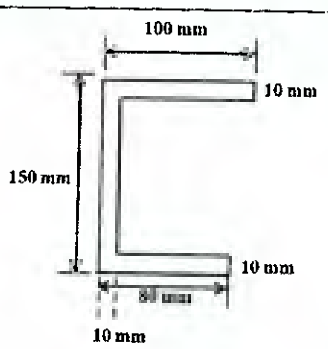
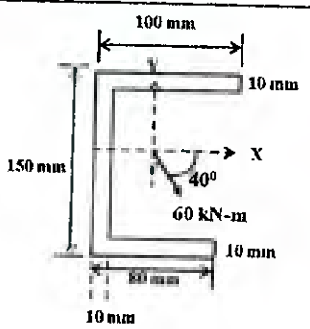
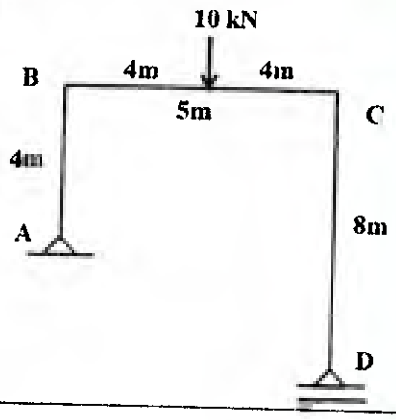
SARDAR PATEL COLLEGE OF ENGINEERING

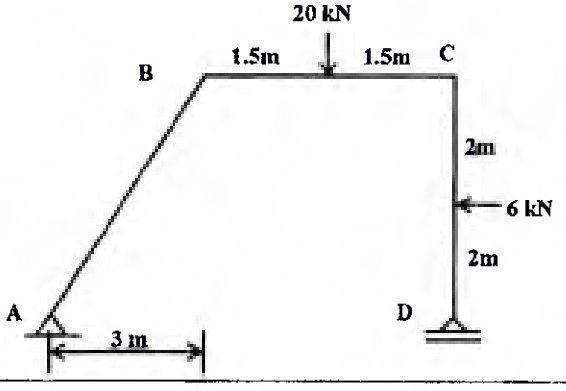
(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations: June 2024

Q.3(a)	**Find the slope at B 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 5
				
Q.3(b)	**Find the slope at A and vertical deflection at C for the beam supported and loaded as shown in figure below. Use moment area method only. Note that the flexural rigidity for AC=2EI and that for CB= EI.**	10	3	3,4 5
				
Q.4(a)	**For the pin jointed frame loaded as shown in figure below, find the vertical deflection of joint D.**	12	3	3,4 6
				
Q.4(b)	**Find the strain energy stored in the truss when loaded as shown in the figure below.**	08	2	3,4 4
				

Q.5(a)	**Locate the principal axes and find the principal moments of inertia for the cross section shown in figure below.**	10	1	3,4	2
					
Q.5(b)	**The angle section with dimensions shown below (same as given in Q. 5(a)) is subjected to a bending moment of 60 kN-m at 40 degrees to the positive X axis as shown in the figure. 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. (The properties of the cross section obtained in Q5(a) can be used. No need to calculate them again.)**	10	1	4	2
					
Q.6(a)	**Determine the horizontal deflection of point D of the rigid jointed frame loaded as shown in figure below.**	10	3	3,4	6
					

Q.6(b)	**Find the crippling loads using (i) Euler's and (ii) 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 hottom Flange width = 250 mm,** **Top and bottom Flange thickness = 10 mm,** **Depth of web = 280 mm, Thickness of web = 12 mm.** **Take E = $2x10^5$ N/mm^2, f_c = 350 MPa and** **Rankine's constant = 1/7000.**	10	4	3,4	7
Q.7(a)	**For the frame loaded as shown in figure below** **a) Find the support reactions** **h) Draw AFD, SFD & BMD for mem hers AB and BC.**	12	4	3,4	3
					
Q.7(b)	**Find the Euler's buckling load for the structural steel column of hollow circular cross section with external diameter 250mm and thickness of the cross section 15 mm. The length of the column is 3m. The column is fixed at one end and free at the other end.** **Take E= 200 GPa**	05	4	3,4	7
Q.7(c)	**Write the expression for strain energy stored in a member due to shear force. Explain the terms involved in the expression**	03	2	2	4

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester June 2024 Examinations

18/6/24

Program: S.Y. B. Tech. Civil

Course Code: PC-BTC404

Course Name: Surveying & Geomatics

Duration: 3hrs.

Maximum Points: 100

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
1.	**Answer the following:**				
	a	Give (atleast two) civil engineering applications you have or you can work with the help of Geographic Information System (GIS).	2	1	1,2
	b.	State, with a neat sketch, the formula for determining the length of long chord of simple circular horizontal curve of radius 'R' and deflection angle 'Δ'.	3	1	1,2
	c	Define 'Geodesy' (2) and give a basic difference between a map and a chart. (1)	3	1	1,2
	d	Distinguish between the ground based, air borne and space borne remote sensing platform.	3	1	1,2
	e	State different types of satellite orbits.	3	1	1,2
	f.	Explain, in short, what you mean by 'Setting out of building foundation trenches'.	3	1	1,2
	g	With a neat sketch define: (i) triangulation survey and (ii) trilateration survey.	3	1	1,2
2.	a	A circular curve has 300 m radius and 60° deflection angle. Compute the following elements of the curve : (i) length of the curve, (ii) tangent length, (iii) length of long chord, and (iv) mid-ordinate	4	4	3
	b	Explain, in detail, the 'Strength of a Figure' in establishing a triangulation system.	4	1,3	1,2
	c.	Explain the 'Earth surfaces', with a neat sketch. (4)	4	1,3	1,2
	d.	With a neat and detailed sketch, explain the phases of a remote sensing system.	8	1,3	1,2
3.	a.	Differentiate (atleast 4 points) between the vector and raster data models that are used in any GIS.	4	1,2	1,2
	b.	For an upgrade of 2% followed by a downgrade of 1.5% on a highway terrain, a summit vertical curve is to be introduced. The rate of change of grade is 0.4% per 100 m. Calculate the length of the vertical curve (2). Calculate the chainages at the initial and final tangent points (2) if the chainage at point of intersection is 1500 m. Calculate the elevations at initial and final tangent points (2), and vertex of the curve (1), if the reduce level (elevation) of point of intersection is 350.750m, respectively. Draw a neat sketch showing the length, chainages and the elevations of the vertical curve (1).	8	1,4	3
	c	(1) Compute the scales, maximum, minimum, and average, of a photograph, if the highest terrain, average terrain, and lowest terrain heights are 610m, 460m, and 310 m above mean sea level (msl), respectively. The flying height above mean sea level is 3000m and	8	1,4	3

		the camera focal length is 152.4 mm. (3) (2) A vertical aerial photograph was taken from a flying height of 1385 m above datum with a 152.4 mm focal length camera. Two ground points A and B appear on the photograph, as '*a*' and '*b*', and their measured photo-coordinates are $x_a = -52.35$ mm, $y_a = -48.27$ mm, $x_b = 40.64$ mm, and $y_b = 43.88$ mm. Determine the horizontal length of line AB if the elevations of points A and B are 204 and 148 m above datum, respectively. (5)			
4.	a.	Explain the need of spatial analysis. (2) Give a real world example, where the spatial analysis can be performed by using a GIS. (2)	4	1,2	1,2
	b	A highway curve is designed as a combined curve, consisting of two cubic spirals and a circular curve, for a maximum speed of 120 kmph, a maximum centrifugal ratio of ¼ and a maximum rate of change of radial acceleration of 0.3m/s^3. Draw a neat sketch of the combined curve showing all necessary elements (1) and calculate: i. Radius of the circular curve, *R* (2) ii. Length of the cubic spiral transition curve, L_s (2) iii. Length of the combined curve, *L* (2) iv. Shift, *S* (1)	8	1,4	3
	c.	Distinguish between Geo-synchronous and Sun-synchronous orbit (4) and explain 'Global Positioning System (GPS) orbits' (type, no. of orbits, no. of satellites in one orbit & its altitude) (4)	8	1,4	1,2
5.	a	Explain the 'attribute query' (non-spatial) based spatial analysis. Give proper example,	4	1,2	1,2
	b	With a neat sketch, explain the working principle of GPS in detail.	8	1,3	1,2
	c.	State the methods of setting out / ground tracing the outline of a foundation plan for a building (2). Explain any one of the methods, that you had adopted on the field, for setting out a given foundation plan. (6)	8	1,3	1,2
6.		e method of determining the length of a transition curve.	4	1,3	1,2
	b.	State the advantages (atleast 4) of using open source GIS, say Quantum GIS (QGIS).	4	1,2	1,2
	c.	With a proper sketch, show and explain the three segments of GPS.	6	1,2	1
	d	Distinguish between active and passive remote sensing sensors (3) and name any three Indian remote sensing satellite system w.r.t. its date of launch and status at present (3).	6	1,2	1,2
7.	a	Explain why a parabola is preferred as vertical curve profile (2) Give the equation for calculating the length of the vertical curve. (2)	4	1,4	1,2
	b	State the objectives (2) and requirements (2) of setting out the building foundation plan.	4	1,3	1,2
	c.	Explain the signal system of GPS and its characteristics	6	1,2	1,2
	d.	(1) Define: (i) Fiducial marks on an aerial photo (1) and (ii) Principal point on an aerial photo (1) (2) Explain different ways to determine the photographic scale. (4)	6	1,3	1,2

Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

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

End Semester Examinations, June 2024

S. Y. 20/6/24

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) "Ready mix Concrete turns out to be a boon for Indian construction industry" justify your answer. Also discuss the various units and their functions you have observed during site visit. (b) How Core test helps to examine the quality of existing concrete? (c) Highlight the importance of Alkai-Silica reaction on durability of concrete.	10 06 04	3 3 1	2 4 2	1.2.1 2.1.2 1.2.1
Q2	a. Differentiate between High and low density concrete	5	1	3	1.3.2
	b. Design concrete for M25 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 – crane and bucket	Specific gravity of 20 mm aggregate (M_2)- 2.80
Strength of cement OPC –43 grade	Workability — slump, 120 mm	Type of coarse aggregate — angular coarse aggregate	Specific gravity of 10 mm aggregate (M_1) — 2.70
Zone of sand — I	Water absorption- M_2-1.8% & M_1- 1.3% Total moisture content M_2-0.7% & M_1- 0.8%	Water absorption fine aggregate- 3.2% Total moisture content in fine aggregate – 2.6 %	Specific gravity of fine aggregate — 2.68

Q3	(a) Design concrete for **M 25** grade using DOE method. Refer the data from Que2 and chart attached at the end of manuscript. (b) Why corrosion of steel reinforcement occurs in concrete? Explain in detail the procedure for conducting Half-cell potentiometric test.	12 08	3 2	4 2	2.1.2 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.** (b) How the composition of Alite, Belite, Celite and Felite controls the properties of cement?	12 8	2 1	3 2	1.3.1 2.3.1

Q5	(a) State the advantages of concrete compaction. Explain different methods for compaction of concrete in detail. (b) Comparison between (i) SRC and RHC (ii) Hand mixing vs. Machine mixing	12 8	1 2	2 2	2.1.2 2.3.1
Q6	(a) What are the benefits of High Performance concrete (HPC)? Discuss in brief different properties of HPC. (b) Explain the effect of w/c on strength, durability and workability of concrete. (c) How Silica fume act as sustainable material to improve the performance of concrete?	10 6 4	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) Constituents of HPC ii) Ultrasonic pulse velocity test iii) pH test of concrete iv) Testing of chemical admixture v) Hydrophobic cement vi) Characteristics strength of concrete	 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

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	38

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

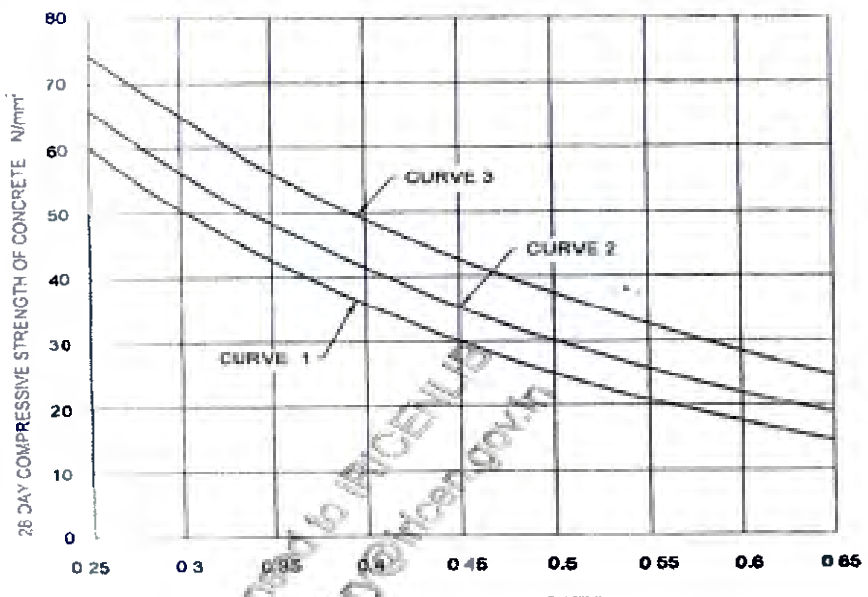
(5) Approximate requirements for mixing water & air content for different workabilities & nominal maximum size of aggregates as per ACI211.1-91

Non air entrained concrete				
Workability or air content (Slump)	Water content kg/m3 of concrete for indicted max mum 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 estimeta 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

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 I) and IS 455 respectively.

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

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[a] kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

[a] 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.

Reference Charts and Tables for DOE Method of Concrete mix design

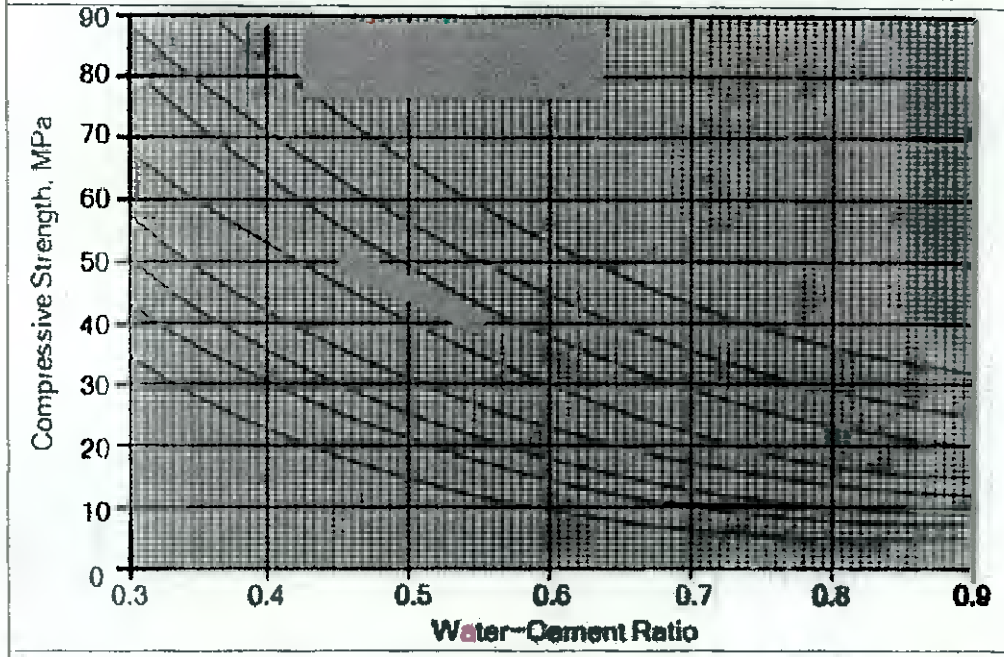
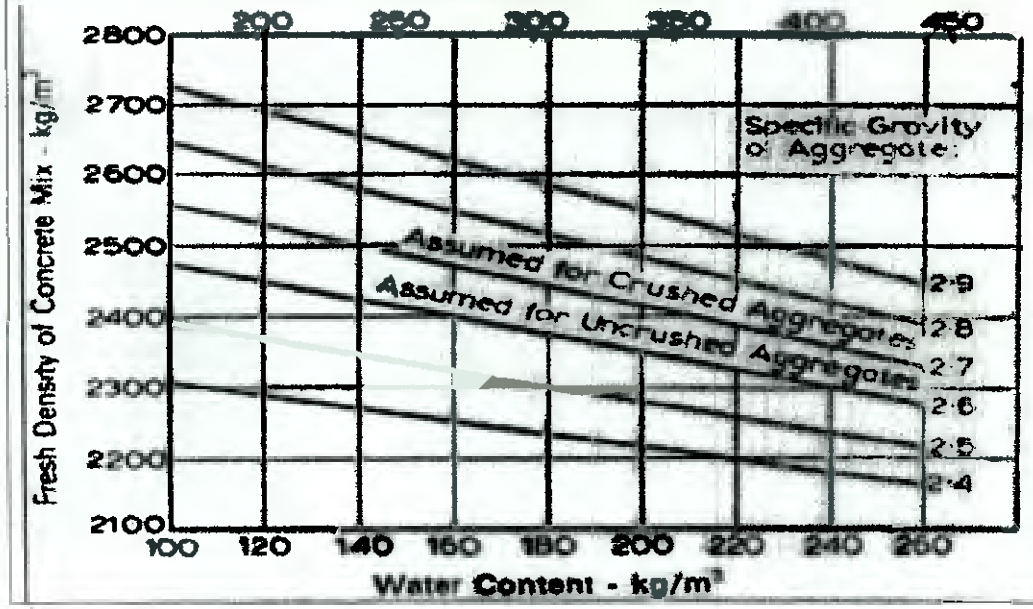


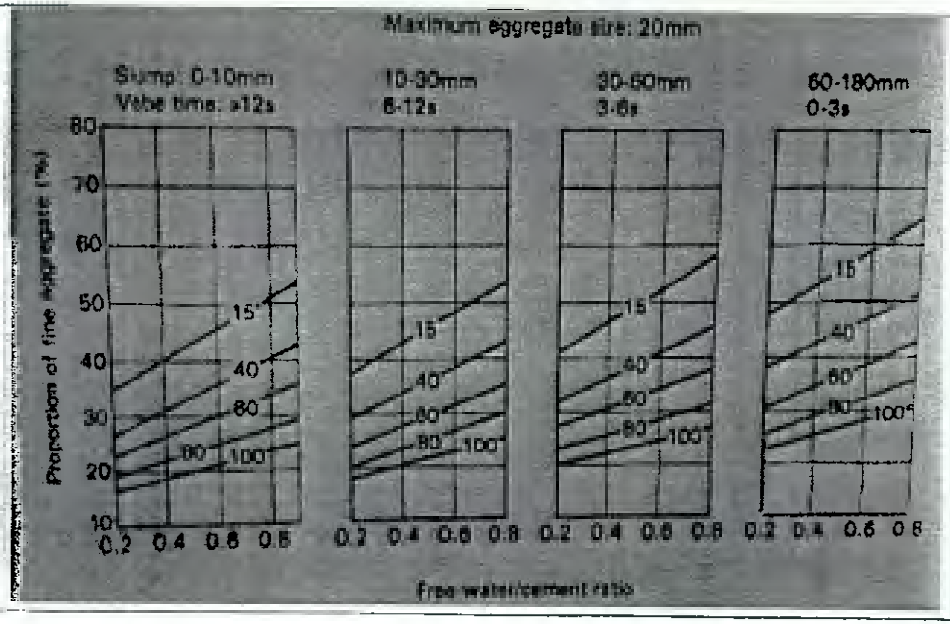
Table 20.47. App. Free water content required for various **workability according** to 1988 British Method

Aggregate		Water content kg/m³ for slump:			
Max size mm	Type	0 — 10 mm	10 — 30 mm	30 — 60 mm	60 — 180 mm
		Vee Bee seconds > 12	6 — 12	3 — 6	0 — 3
10	Un crushed	150	180	205	225
	crushed	180	205	230	250
20	Un crushed	135	160	180	195
	crushed	170	190	210	225
30	Un crushed	115	140	160	175
	crushed	155	175	190	205

Table 20.48. Reduction in water content of table 21.47 when fly ash used.

% of fly ash in cementitious material	Slump in mm Vee Bee seconds	Reduction in water content kg/m³			
		0 — 10 > 12	10 — 30 6 — 12	30 — 60 3 — 6	60 — 180 0 — 3
10		5	5	5	10
20		10	10	10	15
30		15	15	20	20
40		20	20	25	25
50		25	25	30	30





BharatiyaVidyaBhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examinations June 2024

(2023-24)

24/6/24

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

Course Code: PC-BTC-405 **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	Module
1	(a)Explain: Scale effects, distorted and undistorted models, and laws of similarities in dimensional analysis.	10	4	2	1
	(b) The rate of flow 'Q' over a triangular notch is found to depend on the head of water 'H' above the vertex, the density 'ρ', the kinematic viscosity 'υ', the surface tension 'σ' of the fluid, 'θ' the angle of the notch and 'g' the acceleration due to gravity. Express a functional relationship for 'Q' in terms of other variables given. Use any one method of dimensional analysis.	10	4	4	1
2	(a)Explain the phenomenon of water hammer flow in pipelines and derive an expression for pressure rise (Pi) using elastic pipe theory.	10	1	3	2
	(b) (i) Express different types of minor losses in pipe flow in terms of the velocity head with neat sketches.	05	1	4	2
	(ii) Two reservoirs are connected by a pipeline consisting of two pipes, First pipe is of 15 cm diameter and length 10 m and the second pipe is 25 cm diameter and 16 m length. If the difference of water levels in the two reservoirs is 12 m, calculate the discharge. Take f = 0.022.	05	1	4	2
3	(a)Prove that in case of jet of water striking at the center of the moving semi-circular curved vane, the maximum efficiency is less than 60%.	10	1	4	3

	(b) A jet of water with a velocity of 42 m/s impinges without shocks on a series of vanes moving at 15 m/s. The direction of motion of the vanes is inclined at 20^0 to that of the jet, given $Vr_1 = 0.92.Vr$ and absolute velocity of water at exit is to be normal to the motion of vanes. Find: (i) θ and Φ angles; (ii) work done per Newton of water and (iii) η_h.	10	1	5	3
4	(a)Derive an expression for work done and hydraulic efficiency of Pelton wheel turbine. Draw velocity triangles.	10	2	2	4
	(b) The penstock supplies water from a reservoir to Pelton wheel with a gross head of 480 m. One third of gross head is lost in friction in penstock. The rate of flow of water through the nozzle is 5 m^3/s. The angle of direction of jet is 165°. Determine power given by water to runner and also hydraulic efficiency of Pelton wheel. Take speed ratio = 0.46 and Cv = 1.0.	10	2	4	4
5	(a)Explain: (i)Performance of turbine under unit condition, unit quantities	05	2	2	4
	(ii) Cavitation in Reaction turbine and theory of draft tube	05	2	2	4
	(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	10	2	4	4
6	(a)Explain: (i) Priming of a centrifugal pump and Manometric head; (ii) Pumps in parallel, series and multistage pump.	05 05	2 2	2 2	5 5
	(b) A centrifugal pump lifts water under a static lift of 45 meter of which 5 meter is suction lift. The suction and delivery pipes both are 20 cm in diameter. The friction loss in suction pipe is 3 meter and in delivery pipe it is 5 meter. The impeller is 50 cm in diameter and 30 mm wide at outlet and runs at 1000 rpm. The exit blade angle is 22 degrees. If the manometric efficiency of the pump is 85 %, Determine: (i)Discharge from a pump; and (ii)Pressure at the suction and delivery ends of the pump.	10	2	3	5
7	(a)Define prismatic and non-prismatic channel and Explain types of flow in open channel.	10	3	4	6
	(b)Derive Chezy's equation for velocity of flow in open channel. Draw neat sketch.	10	3	4	6

****

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

END SEMESTER EXAMINATION JUNE 2024

Program: SY B.TEC. (C/E) 26/6/24

Duration: 3 Hours

Course Code: IK-BTM201 Maximum Points: 100

Course Name: Indian Traditional Knowledge. Semester: IV

Note: Attempt Any Five Questions

Q.No.	Questions	Points	CO	BL	Module No.
1A	**Complete the Statements by Selecting Proper Options.**	10	2	4	1
1	The Constitution of India adopted in 1950 which enshrines the principles of democracy, secularism and -------. a) Anarchism b) Federalism c) Communism d) Unitary State				
2	Indian Mathematicians such as Aryabhata, Bhaskara and _____ made Pioneering advancements. a) Chandragupt b) Samudragupt c) Brahmagupt d) Shivgupta				
3	_____ Refers to the study of Meaning in Language and interpretation of words, Phrases and sentences. a) Phonology b) Syntax c) Semantics d) Morphology				
4	_____Beals with procedures of rituals, ceremonies and sacrifices. a) Yajur veda b) Rig Veda c) Sam veda d) Atharva veda				
5	The iron pillar of Delhi, dating back to the------ period stands as a testament to the forging corrosion-resistant iron a) Mauryan b) Rashtrakuta c) Gupta d) Kanishka				
6	____ is the traditional Indian science of warfare and martial arts. a) Gandharva veda b) Dhanur veda c) Sthapatya Veda d) Ayur veda				
7	_____ Sahita Provided Comprehensive knowledge about anatomy, diseases and treatments. a) Sushruta b) Bhaskara c) Nagaurjuna d) Yaska				

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

END SEMESTER EXAMINATION JUNE 2024

8	The____ outlook involves to adopt a rational and evidence-based approach. a) Scientific b) Spiritual c) Metaphysical d) Theological				
9	_____ is a traditional practice in yoga consisting breath control. a) Acupuncture b) Chiropractic c) Pranayama d) Niyama				
10	_____focuses on the meters and poetic structure of the vedas. a) Nirukta b) Shiksha c) Kalpa d) Chandas				
1B	Answer the Following	10	3	2	4
A	What are the benefits of Yoga Asanas?				
B	Define the empirical approach to science.				
C	Name the ancient Indian cities known for urban planning.				
D	What are the Three doshas emphasized by Ayurveda?				
E	Define Phonology in linguistics.				
2A	Write about Yoga and Pranayama	10	3	2	5
B	Narrate the types of Vedangas	10	2	1	2
3A	Write a note on Scientific Outlook and Haman Values.	10	4	1	3
B	Explain the ancient Indian engineering knowledge	10	3	2	4
4A	Explain the Relevance of Science and Spirituality.	10	1	2	2
B	Give an account on Sankya Philosophy	10	4	3	7
5A	Analyze the major branches of linguism.	10	2	3	7
B	Discuss the Fundamental Unity of India	10	4	2	1
6A	Give an account of Four Vedas	10	2	4	4
B	Describe the heroic role of India in World Civilization	10	3	3	1
7	Illustrate the Philosophy of the Following. (Any Two) a) Gautam Buddha b) Kabir c) Kanad d) Mahaveer	20	4	2	6

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination – June – 2024

28/6/24

Program: S. Y. B. Tech. Civil

Course Code: BTC - 406

Course Name: Transportation Engineering

Duration: 3 Hour

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	BL
Q.1				
(a)	Discuss the advantages and disadvantages of air transportation	06	1	1
(b)	Discuss the requirement of railway station	07	1	2
(c)	Discuss wing of the aircraft with respect to (i) lift to drag ratio, (ii) surface area, (iii) aspect ratio, (iv) camber shape of wing	07	1	2
Q.2.				
(a)	The length of runway under standard condition is 2400 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 mean value of average daily temperature and maximum daily temperatures in the different months of year are given in Table 2. Apply the necessary correction as per ICAO and FAA and calculate the corrected length of runway.	12	1	3
(b)	Discuss with sketch aircraft parking system.	08	1	2
Q.3.				
(a)	Discuss different types of aircraft parking configuration. Also, state the advantage and disadvantage.	10	1	3
(b)	Design an exit taxiway joining runway and parallel main taxiway. The total angle of turn is 30^0 and turning speed 95 km/hr. Also, draw a neat sketch showing all design elements.	10	2	2

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination – June – 2024

Q.4.				
(a)	What is super elevation? Derive the relationship between super elevation, speed, Gauge and radius of circular curve for Broad Gauge, Meter Gauge and Narrow Gauge type railway track. 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.5				
(a)	Discuss with neat sketch different types of rail	06	1	4
(b)	What is creep of rail? How will you measure?	06	1	2
(c)	Explain with neat sketch coning of wheels and tilting of rail.	08	1	4
Q.6.				
(a)	write short notes on (i) weight of rail (ii) Length of rail	05	2	1
(b)	Discuss about speed of train in India. Also, state the equations suggested by Indian railway for safe speed of train on curve when (i) Transition curve is present (ii) transition curve is absent.	08	2	2
(c)	Calculate the number of rails, number of sleepers, number of fish plate and fish bolt required for construction of 1 km long broad gauge type and meter gauge type railway track. (Assume sleeper density = n + 5)	07	2	2
Q.7.	Write short notes on (any 4)			
(a)	Discuss the Characteristics of Aircraft.	05	1	2
(b)	Take off climb surface	05	1	2
(c)	Site selection for railway station	05	1	2
(d)	Ballast and its requirement	05	1	2
(e)	Advantage and disadvantage of wooden sleepers.	05	1	2

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination – June – 2024

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

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