U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV6PCBFS **Max Marks: 100**
Course: Bridge Engineering and Foundation Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of IS 2911, 456-2000, IRC 6, IRC 21 and Piguards curves allowed

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

				CO	PO	Marks
			UNIT – I			
1	a)		Compare temporary and permanent bridges	CO 1	PO1	**4**
	b)		Discuss the factors to be considered while selecting suitable site for a bridge construction?	CO 1	PO1	**8**
	c)		Design a waterway for a bridge across a stream, having flood discharge of 25 m^3/sec, over a trapezoidal channel, having side slope of 1:1 with a bed falls of 1:800 and a bed width to depth ratio of 6: 1. The bed material is sand with a safe velocity of 2.5 m /sec. The afflux should not be more than 60mm. Take Manning's coefficient N = 0.025.	CO 1	PO3	**8**
			UNIT – II			
2			Design the simply supported deck slab of a culvert for the following data. Clear road width: 7.5 m Kerb width: 0.6 m Effective span: 6.0 m Loading: IRC Class AA tracked vehicle Dispersion factor: 3.0 Total dead load udl: 11.36 KN/m^2 Adopt M20 concrete and Fe415 steel. Sketch the details of reinforcement. Assume overall depth of the slab as 400mm.	CO 1	PO3	**20**
			OR			

	3	a)	Design the intermediate longitudinal girder of a T beam and slab bridge for the following data: Effective span of girders = 16 m Clear width of road way = 7.5m Width of Kerb on either side = 600mm Average thickness of wearing coat = 80 mm Number of longitudinal girders = 3 Spacing of longitudinal girders = 2.5 m Spacing of cross girders = 4m Loading = IRC Class AA tracked vehicle Adopt M30 concrete and Fe 415 grade steel. Shear check is not required. Also sketch the reinforcement details.	***CO*** 1	***PO3***	**20**
			UNIT - III			
	4	a)	Find the uplift capacity of the pile for the following details Dia=0.4m, L=20m, $\gamma sat=19.5kN/m^3$, $\gamma b=18kN/m^3$, $\gamma concrete = 24kN/m^3$, $\phi=38^o$, Dc=15B, K=2.3, $\delta=0.75\phi$, water table is 2m from the ground level.	***CO***2	***PO2***	**10**
		b)	A square pile group of 16 piles penetrates through a filled up soil of 3m depth. The pile diameter is 40cm and pile spacing is 0.75m.The unit cohesion of the material is $18kN/m^2$ and the unit weight of soil is $15kN/m^3$. Compute the negative skin friction of the group.	***CO***2	***PO2***	**10**
			OR			
	5	a)	A 12m long concrete pile 40cm diameter is driven into dense sand having average void ratio of 0.6. The GWT is at a depth of 4m below the ground level. Water content above GWT is 15%. If $\phi=35^o$, Nq=41.4, $N\gamma=42.4$, K=2, $\delta=0.75\phi$, Dc=15B. Estimate the safe load.	***CO***2	***PO2***	**10**
		b)	Briefly explain pile integrity test	***CO***2	***PO1***	**5**
		c)	Briefly explain negative skin friction in piles.	***CO***2	***PO1***	**5**
			UNIT – IV			
	6	a)	Explain briefly the non dimensional approach for vertical piles subjected to lateral loads based on Reese and Matlock theory.	***CO***2	***PO1***	**10**
		b)	Determine the deflection t ground surface (Z=0) for the pile width d=0.4m, L=10m, H=50kN (applied at the ground surface), EI=37x $10^3 kN\text{-}m^2$, $\eta_h=5000kN/m^2/m$. Water table is at the ground level. Refer table 1.	***CO***2	***PO2***	**10**
			UNIT – V			
	7	a)	Explain the rectifying methods for shifting and tilting problems	***CO***2	***PO1***	**14**
		b)	Explain the forces acting on a well foundation	***CO***2	***PO1***	**6**

Table 1 (**For Q 6b**) Non dimensional coefficients for laterally loaded pile (Reese and Matlock)

Z	A_y	A_s	A_m	A_v	A_p
0.0	2.435	– 1.623	0.000	1.000	0.000
0.1	2.273	– 1.618	0.100	0.989	– 0.227
0.2	2.112	– 1.603	0.198	0.956	– 0.422
0.3	1.952	– 1.578	0.291	0.906	– 0.586
0.4	1.796	– 1.545	0.379	0.840	– 0.718
0.5	1.644	– 1.503	0.459	0.764	– 0.822
0.6	1.496	– 1.454	0.532	0.677	– 0.897
0.7	1.353	– 1.397	0.595	0.585	– 0.947
0.8	1.216	– 1.335	0.649	0.489	– 0.973
0.9	1.086	– 1.268	0.693	0.392	– 0.977
1.0	0.962	– 1.197	0.727	0.295	– 0.962
1.2	0.738	– 1.047	0.767	0.109	– 0.885
1.4	0.544	– 0.893	0.772	– 0.056	– 0.761
1.6	0.381	– 0.741	0.746	– 0.193	– 0.609
1.8	0.247	– 0.596	0.696	– 0.298	– 0.445
2.0	0.142	– 0.464	0.628	– 0.371	– 0.283
3.0	– 0.075	– 0.040	0.225	– 0.349	0.226
4.0	– 0.050	0.052	0.000	– 0.106	0.201
5.0	– 0.009	0.025	– 0.033	0.013	0.046

Z	B_y	B_s	B_m	B_v	B_p
0.0	1.623	– 1.750	1.000	0.000	0.000
0.1	1.453	– 1.650	1.000	– 0.007	– 0.145
0.2	1.293	– 1.550	0.999	– 0.028	– 0.259
0.3	1.143	– 1.450	0.994	– 0.058	– 0.343
0.4	1.003	– 1.351	0.987	– 0.095	– 0.401
0.5	0.873	– 1.253	0.976	– 0.137	– 0.436
0.6	0.752	– 1.156	0.960	– 0.181	– 0.451
0.7	0.642	– 1.061	0.939	– 0.226	– 0.449
0.8	0.540	– 0.968	0.914	– 0.270	– 0.432
0.9	0.448	– 0.878	0.885	– 0.312	– 0.403
1.0	0.364	– 0.792	0.852	– 0.350	– 0.364
1.2	0.223	– 0.629	0.775	– 0.414	– 0.268
1.4	0.112	– 0.482	0.688	– 0.456	– 0.157
1.6	0.029	– 0.354	0.594	– 0.477	– 0.047
1.8	–0.030	– 0.245	0.498	– 0.476	– 0.054
2.0	–0.070	– 0.155	0.404	– 0.456	– 0.140
3.0	–0.089	0.057	0.059	– 0.213	0.268
4.0	–0.028	0.049	–0.042	0.017	0.112
5.0	–0.000	0.011	–0.026	0.029	– 0.002

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