Code - 05

CIVIL ENGIEERING

Time : 3 Hours

Maximum Marks : 150

Note : Attempt FIVE questions. All questions carry equal marks. Question No. 1 is compulsory. Answer any two questions from Part - I and two questions from Part - II. The parts of same question must be answered together and must not be interposed between answers to other questions.

1. Attempt any of the following (4 x 7.5 = 30)

a)Define an admixture? Explain the role of plasticizer in Concrete.

b)A bolt is required to withstand an axial tension of 2000 kg and a transverse shear of 1500 kg. Determine the diameter of the bolt as per distortion energy theory. Yield stress of the material is 3000 kg/cm^2. Adopt a safety factor of 3.0.

c)What is shift in transition curve? Explain with neat sketch .

d)Determine the Shape factor of rhombus of Size b x d, which is resting in such a way that there one diagonal is vertical and other is horizontal.

e)With suitable stretch explain the Indian Standard classification systems for soil.

f)Draw the oxygen deficit curve of a polluting stream and marks salient point on the curve.

g)State Castiglione's Second theorem and explain its use in structural analysis.

PART - I

2. a) A laced column of effective length 6 m is to carry an axial load of 800 KN. ISMC 250 readily available is to be used. Determine the spacing between the sections for maximum efficiency and check the adequacy of the action. Design a suitable lacing system assuming flats are available and 22 mm. diameter rivets are used for connection. Properties of ISMC 250: Area = 38.67 cm^2; I_x=3816.8 cm^4, I_y=219.1 cm^4; r_x=9.94 cm; r_y=2.38 cm; flange width =80 mm; distance of the c.g, from the web =2. 3 cm;distance of the centre of rivet hole in the flange from the web=45 mm.

Allowable compressive stress may be taken from the following table:- (20)

Slenderness Ratio	50	60	70	80	90	100	110	120	130	140
Allowable stress in MPa:	132	122	112	101	90	81	71	64	57	50

b)The Size of reinforced concrete beam is restricted to 250mm x 400mm. It carries a superimposed load of 25 KN/m over a span of 7m. Determine the reinforcements for the beam by limit state method. Use M20 concrete and F 415 steel. Effective cover to steel = 40 mm. (10)

. a) A water supply main trifurcates at a junction point J into three branches each feeding a separate reservoir. The detail of the pipes and reservoir are as follows:

Pipe	Diameter	Length	f	Feeding to reservoir elevation
J P	15 cm	1.5 km	0.02	P= 85.00m
J Q	15 cm	2.0 km	0.02	Q= 75.00 m
J R	15 cm	2.5 km	0.02	R= 65.00 m

If the inflow from the main at the junction is 0.25 m^3/s, determine the delivery into each reservoir. (20)

b)A wide rectangular channel Carries a flow of 2.76 m^3/s per meter width, the depth of flow being 1.50 m. (i) Calculate the minimum rise in the floor at a section required to produce critical flow Conditions. (ii) What is the corresponding fall in the water level? (10)

. a) A 2m wide strip footing is to be placed in a sand layer 2 m thick at a depth of 1m below the ground surface. The sand is underlain by a layer of saturated clay which is 1 m thick. The clay overlies a bed of dense sand. The ground- water table is at the level of the top of the clay layer. The bulk unit weight of sand above the clay layer is 20 kN/m^3 and submerged unit weight of clay is 8 kN/m^3. The footing is designed to

carry a load of 220 kN/m^2. Compute the probable ultimate settlement of the footing below its centre. Also determine the elapsed time in which 10 per cent and 90 per cent of the ultimate settlement will occur. It is known from a graph between pressure and void ratio for clay that the void ratio corresponding to vertical pressure of 44.4 kN/m^2 and 180 kN/m^2 are respectively 1.16 and 1.02. The coefficient of consolidation for the soil is 4 x 10^{-4}cm^2/s The vertical pressure (α_z) below the centerline of uniformly loaded strip footing (intensity q) of width B may be taken as:

Depth	α_z
0.1B	0.997q
0.5B	0.817q
1.0B	0.550q
2.0B	0.306q

The time factor (T_v) corresponding to the degree of consolidation (U%)is as follows.

U (%)	10	90
T_v	0.008	0.848.

(20)

b)A Smooth retaining wall 7 m high retains dry granular backfill weighing 17 kN/m^3 to its level surface. The active thrust on wall is 96 kN/m of wall. What will be the total active thrust if water table comes upto backfill surface? Take Specific gravity of backfill = 2.6 5. (10)

PART - II

5. a) While aligning a highway in a built up area it was necessary to provide a horizontal curve of radius 325m. Design the following geometric features:
i) Superelevation (ii) Extra widening of pavement and
(iii) Length of transition curve.
The data available being- design speed 80 kmph; length of wheel base of largest truck =6.1 m. pavement width=10.5m. (15)

b)Two tangents intersect at Chainage 1200m, the deflection angle being 40°. Compute the data for setting out a 400 m radius curves by deflection angles. Take 30 m chord lengths in the general reach. (15)

a) A large sample of peak floods data was available for a river. Flood frequency computations, using Gumbel's method, yield the following results:

Return Period T (years)	Peak Period m^3/sec
50	30,800
100	36,300

Estimate the magnitude of a flood for this river with a return period of 200 years. (15)

b)The interdependence of a job consisting of seven activities A to G is given as:

Activity	A	B	C	D	E	F	G
Predecessor activity	-	-	A	B	A	B	C,D
Succeeding activity	C,E	D,F	G	G	-	-	-

The time estimates, in days, for each activity are	
Activity	Time estimates
A	6-9-18
B	5-8-17
C	4-7-22
D	4-7-16
E	4-7-10
F	2-5-8
G	4-10-22
Z(+)	% Probability
0.8	78.81
0.9	81.50
1.0	84.13
1.1	86.43
1.2	88.49

Draw the network and determine the probability of completing the job in 35 days. (15)

a) A rectangular settling tank without mechanical equipment is to treat 1 million liters of raw water per day. If the design criteria are that, the detention period is 2.5 hours, the velocity of flow is 8 cm/ minute and depth of water and sediment is 4.5m, then what would be :i) The length of the tank

ii) The width of the tank if an allowance of 1.5 m is to be made for sediment.

iii) overflow rate of the tank? (15)

b)The colony of an industrial estate has population of 2600 persons. The sewage flow is 125 l/c/day. The 5 days BOD of the sewage is 350 ppm. Design the oxidation pond for the treatment of sewage. (15)