

Question Paper 2011

Civil Engineering (Paper II)

SECTION – I

(Civil)

- (a) Write a short note on Consumptive use of water. (15)

(b) Advantages and disadvantages of concrete sleeper. (15)
- (a) To determine the mean elevation of a station O interpolated in a triangulation system, the following observations were made :

Station	Height of Inst.	Station observed	Distance in m	Height of signal	Vertical angle	Remarks
O	1.53	D	3684	5.58	+1°1'20"	R sin 1° = 30.88 m
	1.53	E	4698	4.11	-0°52'50"	m = 0.07
	1.53	F	5028.6	4.9	-0°34'10"	log sin 1° = 6.685575

Find the mean elevation of station O, given that the elevations of D, E and F are 293.58, 157.725 and 179.355 respectively. (15)

- (b) In a consolidation test on a soil, the void ratio of the sample decreases from 1.24 to 1.12 when they pressure is increased from 20 to 40 tonnes/sq.m. Calculate the co-efficient of consolidation in $m^2/year$, given that the co-efficient of permeability of the soil during this pressure increment is 8.5×10^{-3} cm/sec. (15)
- (a) In a plate bearing test on pure clayey soil failure occurred at a load of 12.2 tonnes. The size of the plate was 45 cm \times 45 cm and the test was done at the depth of 1.0 m below ground level. Find out the ultimate bearing capacity for a 1.5 m wide continuous wall footing with its base at a depth of 2 m below the ground level. The unit weight of clay may be taken as 1.9 gm/cc and $N_c = 5.7$ and $N_q = 1$ and $N_r = 0$. (20)

(b) Write a short note on the significant properties of soil. (10)
- (a) A rectangular channel 2.0 m wide has a discharge of 250 lit/sec which is measured by a right angled V-notch weir. Find the position of the apex of the notch from the bed of the channel if the maximum depth of the water is not to exceed 1.3 m. Take $C_d = 0.62$. (18)

(b) List down the modes of water penetration into road structure with a neat sketch. (12)
- (a) Measure to control water pollution. (10)

(b) A room 600 cm long and 500 cm wide has a flat roof. There is one T-beam in the centre (cross section below the slab 30 cm \times 50 cm) and the slab is 15 cm thick. Estimate the quantity of iron bars required for reinforcement (for the T-beam only) from the data given below :

Main bars – 8 nos. of 25 mm dia. in 2 rows of 4 each (all 4 in the bottom being straight and others being bent)

Stirrups – 10 mm dia. and 15 cm centre to centre throughout

Anchor bears – 2 nos. of 16 mm dia. (20)
- (a) What is analysis of rates ? And explain its purpose. (15)

(b) Explain the manufacturing of cement by wet process. (15)

SECTION – II

(Structural)

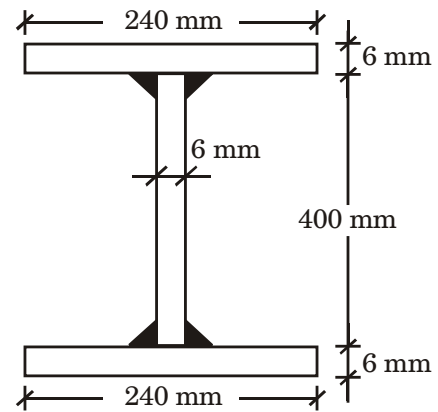
7. (a) Discuss the significance of cold weather concreting with special emphasis on problems faced by concrete in freezing conditions. (15)
- (b) Define workability of concrete and explain briefly the factors affecting workability. (15)
8. Design a cantilever beam with a clear span of 3 m which carries a superimposed load of 15 kN/m. Its depth varies from 500 mm at the fixed end to 150 mm at the free end. Show reinforcement with a neat sketch. (30)
9. A simply supported beam of 4.5 m effective span is carrying a live load of 25 kN/m. The size of the beam has to be restricted to 250 mm × 380 mm depth. Design the beam for bending using limit state method. The design coefficients are $K = 0.138$; $\tau = 0.80$; $K_u = 0.479$. Use M20 grade concrete and Fe 415 steel. (30)
10. Design a beam of 4.8 m span carrying a total load of 15 kN/m inclusive of self weight. The beam is laterally supported throughout. (30)
11. (a) Compute the allowable compressive load on an axially loaded steel column having a cross section as shown in the figure and an effective length of 3.5 m.

For the purpose of computing the cross sectional area, the moment of inertia and the radius of gyration, the maximum width of the outstand should be taken out not more than 16 times the thickness of the flange. Also, the maximum depth of web should be taken not more than 50 times its thickness.

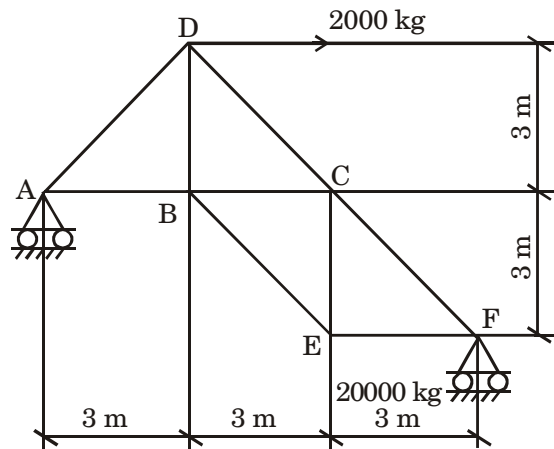
(15)

Use the following data :

l/r	Allowable stress in axial compression (kg/cm ²)
60	1130
70	1075
80	1007
90	928
100	840



- (b) Determine the forces in the members of the truss shown in the figure below : (15)



12. A fixed beam of constant section carries a load transferred from a rigid bracket as shown in figure. Find the bending moment and reactions at the fixed ends and plot S.F.D. and B.M.D (30)

