

**B.Tech. Civil (Construction Management) /
B.Tech. Civil (Water Resources Engineering)**

Term-End Examination

December, 2006

ET-508(A) : STRUCTURAL DESIGN – I

Time : 3 hours

Maximum Marks : 70

Note : *Candidates are required to answer **all** the questions. Use of Code of Practice IS-456 and calculators is allowed. Any missing data may be suitably assumed. The marks allotted to the questions are shown in the margin.*

1. Design a cantilever retaining wall to retain a level earthfill of 4.0 m above ground level. The surcharge on the earthfill is 40 kN/m^2 . Assume good soil for foundation at a depth of 1.25 m below the ground level with a safe bearing capacity of 160 kN/m^2 . The unit weight and the angle of repose of soil are 16 kN/m^3 and 30° respectively. Assume the coefficient of friction between soil and concrete to be 0.5. Use M-20 concrete and Fe-415 steel.

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OR

(a) Design a simply supported slab for a room having inside dimension 3×6 m. The thickness of the supporting wall is 300 mm. The slab carries 100 mm thick lime concrete at its top, the unit weight of which may be taken as 19 kN/m^3 . The live load on the slab may be taken as 2.5 kN/m^2 . Use M-20 concrete and Fe-415 steel. 20

(b) Determine the moment of resistance (MR) for T-beam of the following configuration :
 $d = 500 \text{ mm}$, $b_f = 1000 \text{ mm}$
 $D_f = 130 \text{ mm}$, $b_w = 250 \text{ mm}$
 $A_{st} = 4 \# 28 \phi$
Use M-20 concrete and Fe-415 steel. 20

2. Answer any **two** of the following questions : 2×15=30

(a) A reinforced concrete beam is 200 mm wide and 400 mm deep from the compression edge to the centre of tension steel. The compression reinforcement consists of 2 bars of 20 mm dia. and tensile reinforcement 3 bars 20 mm dia. The centre of compression steel is at a distance of 40 mm from top edge of the beam. The bending moment at the section is 40 kNm. Calculate the compressive stress in concrete and stress in both compressive and tensile steels. (Assume $m = 13.33$) 15

- (b) Check for the safety of the rectangular column section $b \times D = 300 \times 500$ mm reinforced with 12 # 20 ϕ distributed equally on all sides, applied with an axial load, $P = 500$ kN and a bending moment about minor axis, $M_x = 15$ kNm and bending about major axis $M_y = 35$ kNm, M-20 concrete and Fe-415 steel with cover to reinforcement of 50 mm is provided. 15
- (c) Design for flexure only an RC beam of 5 m clear span supported on two walls of 300 thickness and carrying a superimposed load of 20 kN/m.
(Use $K_B = 20$, M-20 concrete and Fe-415 steel) 15