

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

Term-End Examination

00662

December, 2016

ET-508(A) : STRUCTURAL DESIGN - I

Time : 3 hours

Maximum Marks : 70

Note : *Attempt any four questions. All questions carry equal marks. Use of code of practice IS : 456 and scientific calculator is allowed. Any missing data may be suitably assumed. Use limit state design method unless noted otherwise.*

1. Design a cantilever beam of span 2 m and constant width 300 mm. This beam has to carry a distributed load of 30 kN/m excluding its self-weight. Use M 25 grade of concrete and Fe 415 steel. Assume moderate exposure condition. $17\frac{1}{2}$
2. Determine the moment of resistance of a beam 250 mm × 500 mm (overall). This beam is reinforced with 2 – 12 mm ϕ in compression and 4 – 20 mm ϕ in tension zone. Assume effective cover of 40 mm for both reinforcements. Adopt M 20 grade of concrete and Fe 415 grade of steel. Take $f_{sc} = 300 \text{ N/mm}^2$ for compression reinforcement. $17\frac{1}{2}$

3. Design the reinforcement for a column of size 400 mm × 400 mm. This column is subjected to an axial load of 2200 kN. The unsupported length of the column is 3.0 m with both ends effectively held in position but restrained against rotation at one end only. Adopt concrete of grade M 25 and steel of grade Fe 415. $17\frac{1}{2}$
4. Design a slab of size 4 m × 6 m carrying an imposed load of 4 kN/m². Two adjacent edges of the slab are discontinuous and remaining are continuous. Use M 25 grade of concrete and Fe 415 grade of steel. $17\frac{1}{2}$
5. Design a circular tank with flexible base for a capacity of 400 k litres. The depth of water is to be 4 m including a free board of 200 mm. Adopt M 30 concrete and HYSD bars. Use working stress method of design. $17\frac{1}{2}$
6. (a) Discuss the various steps to design a reinforced concrete slab culvert. Draw typical details of reinforcement in the slab culvert. 9
- (b) Explain briefly the steps to design a cantilever retaining wall. Draw typical reinforcement details of the cantilever retaining wall. $8\frac{1}{2}$
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