53 (CE 501) DGST

2014

DESIGN OF STRUCTURE-I

Paper : CE 501

Full Marks : 100

Pass Marks : 30

Time : Four hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions from* ***six.***

1. *(a)* Explain the concept of 'transformed section', as applied to the analysis of reinforced concrete beams under service loads. A reinforced concrete beam section of size 300*mm* width and 500*mm* effective depth is reinforced with 4 nos. of 16*mm* Φ HYSD. What are the stresses induced in the top compression fibre and in tensionsteel, if the grade of concrete is *M*20 and the external Bending Moment on the section is 50*kNm*. 5+5=10

(b) Design a reinforced concrete beam section of width 250*mm* to resist a bending moment of 80*kNm*. Use *M*25 grade concrete and *Fe*415 grade steel. 10

2. What do you mean by Limit State method ? Explain various limit state methods. A reinforced concrete beam of size 300*mm* × 400*mm* effective depth is subjected to a service bending moment of 150*kNm*. Design the beam section assuming appropriate grade of concrete and steel. 8+12=20

3. (a) What are the mechanisms by which bond resistance is mobilised in reinforced concrete ? Explain different types of bond, what do you mean by developmental length ? 8

(b) A beam section of sectional size 250*mm* × 400*mm* effective depth is subjected to a shear force 100*kN* at working loads. The shear reinforcement at the section consists of 2 legged 8 $\overline{\Phi}$ stirrups at the rate of 150*mm c/c*. Calculate the tensile reinforcement requirement in the section for safety in shear. 12

4. A restrained concrete slab is of size $4m \times 6m$ having 2 adjacent edges discontinuous. Calculate the design moments for the slab if the live load is $4kN/m^2$ and finish surface $1kN/m^2$. Use M 20 grade concrete and Fe 415 steel. 20

5. Design a circular column using helical reinforcement and having an axial load of $2000kN$. The unsupported length of the column is $3{\cdot}3m$. Use M 25 grade concrete and Fe 415 steel. 20

6. Design an isolated footing to support a column of size $300mm \times 500mm$ to carry an axial load of $1500kN$. The safe bearing capacity of soil is $130kN/m^2$. The width of the footing is limited to $3m$. Use M 20 grade concrete and Fe 415 steel. 20