KATIHAR ENGINEERING COLLEGE, KATIHAR

Code: 011617

B.Tech 6th semester Mid Term Exam

Design of Concrete Structure-I

Time: 2 hours   **Full Marks: 20**

Instructor: Rashid Mustafa

Instructions: Answer any five question in which question number 1 is compulsory

The marks are indicated in the right- hand margin

1. Choose and write the correct option   **1x4= 04**

(i) The flexural strength of M25 concrete as per **IS 456:2000** is

   (a) 4.0 MPa   (b) 3.5 MPa   (c) 3.0 MPa   (d) 1.75 MPa

(ii) If a 2-legged 8 mm diameter Fe415 bar is used as shear reinforcement for a beam of width 230 mm and effective depth 300 mm, what is the nearest magnitude of the spacing of minimum shear reinforcement as per **IS 456:2000** is?

   (a) 420 mm   (b) 390 mm   (c) 350 mm   (d) 320 mm

(iii) Consider modular ratio as 13, grade of concrete as M20 and grade of steel as 415, what is the ratio of balanced depth of neutral axis as per working stress method to the balanced depth of neutral axis as per limit state method ?

   (a) 12/7   (b) 11/3   (c) 7/12   (d) 3/11

(iv)Which one of the following sections performs better on the ductility criterion?

   (a) Balanced section   (b) Over-reinforced section

   (c) Under-reinforced section   (d) None

2. What are the various assumptions on which the design for the limit state of collapse in flexure is based? Calculate the limiting value of depth of neutral axis in terms of effective depth for the grade of steel having yield strength $f_y = 250$ N/mm^2 and $E_s = 2 \times 10^5$ N/mm^2.   **04**

3. Calculate the ultimate moment of resistance of an R.C.C. rectangular beam with the following data:

Breadth of beam = 230 mm, Overall depth of beam = 550 mm

Tension steel consists of 4 nos. of 20 mm diameter bars of grade Fe 415,Clear Cover = 30 mm, Concrete grade- M 20

Hence determine the intensity of safe superimposed load (excluding self-wt) this beam can carry on a simply supported span of 5 m. Use LSM **04**

4. Determine the moment of resistance of a T section having the following properties:

Flange width = 2000 mm, Flange depth = 100 mm, Web width = 250 mm, Effective depth = 750 mm, Area of steel = 8 bars of 20 mm diameter. Take M 20 concrete and Fe 415 steel. Use LSM.

04

5. Design shear reinforcement for a factored shear force of 100 kN. The cross section is 250 mm x 400 mm. Assume M20 concrete and Fe 415 reinforcement. Adopt 8mm diameter as web reinforcement. Take τ_c= 0.73 N/mm^2, effective cover = 35 mm, $\tau_{c\ max}$ = 2.8 N/mm^2. **04**

6. A reinforced concrete rectangular section of size 250 x 500 mm is to be designed for a factored moment of 225 kN-m. The grades of concrete and HYSD steel are M20 and Fe415, respectively. Take f_{sc} = 353 MPa, effective cover = 50 mm. **04**

7. A rectangular concrete section, 25 cm wide, 50 cm overall deep is reinforced with three 16 mm diameter HYSD (Fe 415) at an effective cover of 4 cm from bottom face. If permissible stresses in concrete in bending compression and steel are 50 kg/cm^2 and 2300 kg/cm^2 respectively; modular ratio = 19. Calculate moment of resistance of the section using working stress method. **04**

----End of the question paper----

Note: Solution will be uploaded shortly on the college website **www.keck.ac.in**