# KATIHAR ENGINEERING COLLEGE, KATIHAR

## CIVIL ENGINEERING, 3rd Year (Semester-VI)

**Subject: Design of concrete structure-I** **Max. Marks: 05**

**Date of Submission: 30/03/2020** **Instructor: Prof. Rashid Mustafa**

### Assignment-II

**Q.1** The rectangular beam of width, 300 mm is having overall depth of 600 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 5-20 mm diameter bars. The clear cover is 25 mm. The design shear strength of concrete, $\tau_c$, MPa for M20 grade of concrete is given as (100 Ast/bd, $\tau_c$, MPa) (0.25,0.36), (0.50, 0.48), (0.75, 0.56), (1.00, 0.62), (1.25, 0.67), (1.50, 0.72), (1.75, 0.75), (2.00, 0.79), (2.25, 0.81), (2.50, 0.82) As per limit state, the critical shear capacity of beam is equal to

(a) 76.582 kN (b) 102.109 kN (c) 127.636 kN (d) 153.164 kN

**Q.2** A rectangular beam of width 300mm and overall depth 450mm is provided with 20mm dia. Fe 415 bars on the tension side with a clear cover of 25mm. The beam is made with concrete having a $\tau_{c,max}$ = 3.1 MPa. For the reinforcement provided and the grade of concrete used, it may be assumed that the $\tau_c$= 0.80 MPa. The design shear in beam B1 is 350 KN and in beam B2 is 450 KN. Considering the provisions of IS: 456-2000, which of the following is true?

(a) Shear reinforcement should be designed for 250 kN for beam B1 and the section for beam B2 should be revised.

(b) Nominal shear reinforcement is required for beam B1 and the shear reinforcement should be designed for 350 kN for beam B2.

(c) Shear reinforcement should be designed for 250 kN for beam B1 and the shear reinforcement should be designed for 350 kN for beam B2.

(d) The sections for both beam B1 and B2 should be revised.

**Q.3** The rectangular beam of width, 300 mm is having overall depth of 600 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 5-20 mm dia bars. The clear cover is 25 mm. The design shear force is 500 kN The design shear strength of concrete, $\tau_c$, MPa for M20 grade of concrete is given as (100 Ast/bd ,$\tau_c$, MPa) (0.25,0.36), (0.50, 0.48), (0.75, 0.56), (1.00, 0.62), (1.25, 0.67), (1.50, 0.72), (1.75, 0.75), (2.00, 0.79), (2.25, 0.81), (2.50, 0.82). For M20 grade of concrete, the maximum shear stress permitted is 2.80 MPa. The spacing of stirrups for 2-legged stirrup of diameter 12 mm is closer to:

(a) 100 mm (b) 200 mm (c) 300 mm (d) Increase depth of beam

**Q.4** Calculate the effective width of a RCC T-beam section having the following sectional properties: Distance between points of zero moments in the beam = 3000mm; Width of flange = 1800mm; Thickness of flange = 150 mm; Breadth of the web = 200 mm; Effective depth = 300 mm; Reinforcement = 4-20 mm diameter Fe500 steel bars on tension side. Grade of concrete = M25.

(a) 1800mm (b) 1400mm (c) 1600mm (d) 1200mm

**Q.5** According to working stress method as per IS456:2000, for grade of concrete M20 and grade of steel Fe415, the balance percentage of steel will be ---------- %

**Q.6**

For a rectangular size of $300\ mm \times 350\ mm$, $\sigma_{cbc} = 10\ N/mm^2$ and $\sigma_{st} = 230\ N/mm^2$ clear cover : 25mm and tensile reinforcement : 4-20mm dia HYSD bars, the position of neutral axis from the compression side is

(a) 82 mm (b) 102 mm (c) 122 mm (d) 142 mm

**Q.7** The rectangular beam of width, 250 mm is having effective depth of 317 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. As per limit state method, the lever arm in a balanced section is equal to ---------- mm

**Q.8** A rectangular beam of width 200 mm and effective depth 300 mm is subjected to limit state shear of 80 kN and torsional moment of 6 kN-m. The equivalent value of shear will be ----------kN

**Q.9** A simply supported beam having 200 mm width and 450 mm effective depth supports a total uniformly distributed load of 2,00,000 N. The nominal shear stress will be ---------- $N/mm^2$

**Q.10** A reinforced concrete beam having simply supported span of 6 m, carries a dead load of 15 kN/m and imposed load of 20 kN/m at service. What is the width of the rectangular cross section of RC beam if d/B =2 .Take M25 grade of concrete and Fe415 of steel.

(a) 200 mm (b) 260 mm (c) 300 mm (d) 350 mm

**Q.11** The moment of resistance of a T section having flange width = 2000 mm, Flange depth = 100 mm, Web width = 250 mm, Effective depth = 750 mm, area of steel = 8 bars of 200 mm $\phi$. Material used = M25 grade of concrete and Fe415 HYSD bars.

(a) 760.23 kN-m (b) 661.35 kN-m (c) 561.53 kN-m (d) 476.34 kN-m

**Q.12** A rectangular beam 200 mm wide has an effective depth of 350 mm. It is subjected to a bending moment of 24,000 N-m. The permissible stresses are c = 5 $N/mm^2$, t = 140 $N/mm^2$ and m=18. The required area of tensile reinforcement will be ----------$mm^2$

**Q.13** The permissible bending compressive strength for M25 grade of concrete is 8.5 N/mm$^2$. The short term and long term modular ratios are nearly

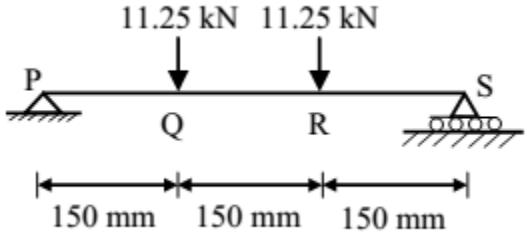
(a) 8 and 11 (b) 8 and 8 (c) 11 and 11 (d) 11 and 6

**Q.14** Design strength for M25 concrete in direct compression, bending compression and flexural tension are respectively

(a) 10 MPa, 11.15 MPa, and 3.5 MPa (b) 25 MPa, 11.15 MPa, and 3 MPa

(c) 10 MPa, 12.5 MPa, and 3.5 MPa (c) 25 MPa, 11.15 MPa, and 2.57 MPa

**Q.15** A 450 mm long plain concrete prism is subjected to the concentrated vertical loads as shown in the figure. Cross section of the prism is given as 150 mm × 150 mm. Considering linear stress distribution across the cross-section, the modulus of rupture (expressed in MPa) is----------




**Q.16** The rectangular beam of width, 300 mm is having overall depth of 400 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 4-20 mm dia bars. In the compression side, the reinforcement is provided by 2-12 mm dia bars. The clear cover is 25 mm. The moment capacity of the section due to concrete as per limit state method is ----------kN-m

**Q.17** The rectangular beam of width, 300 mm is having overall depth of 400 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 4-20 mm diameter bars. In the compression side, the reinforcement is provided by 2-12 mm diameter bars. The clear cover is 25 mm. The salient points of design stress-strain curve of Fe415 is given by (strain, stress, *N/mm*2) (0.00144,288), (0.00163,306), (0.00192,324), (0.00241, 342), (0.00276, 351), (0.00380, 360). The stress in steel at compression level is equal to ---------- N/mm$^2$

**Q.18** The rectangular beam of width, 300 mm is having overall depth of 400 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 4-20 mm dia bars. In the compression side, the reinforcement is

provided by 2-12 mm dia bars. The clear cover is 25 mm. As per limit state method, the section will take additional moment of

(a) 25.362 kNm (b) 31.702 kNm (c) 38.043 kNm (d) 44.383 kNm

**Q.19** The rectangular beam of width, 300 mm is having overall depth of 600 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe415. The tensile reinforcement is provided by 5-20 mm dia bars. The clear cover is 25 mm. The design shear force is 350.0 kN The design shear strength of concrete, $\tau c$, MPa for M20 grade of concrete is given as (100 Ast/bd, $\tau c$, MPa) (0.25,0.36), (0.50, 0.48), (0.75, 0.56), (1.00, 0.62), (1.25, 0.67), (1.50, 0.72), (1.75, 0.75), (2.00, 0.79), (2.25, 0.81), (2.50, 0.82). For M20 grade of concrete, the maximum shear stress permitted is 2.80 MPa. The spacing of stirrups for 2-legged stirrup of diameter 12 mm is closer to

(a) 90 mm (b) 130 mm (c) 180 mm (d) 220 mm

**Q.20** $V_{us}/d$ depends on for vertical stirrups

(a) $A_{sv}$ (b) spacing of shear reinforcement (c) grade of steel (d) all of these.

**Happy Learning and Be safe**