40+40+40+34+4

T.E Civil VI CBSGS (168)

Q.P.Code: 018625

14.6.17

(3 Hours) [Total Marks: 80]

N.B.:

1. **Q.1** is **compulsory**
2. Attempt any **three** question out of remaining **five**
3. Assume **suitable** data if **required**

Q.1 Write short notes on 20

(A) Assumptions made in working stress method

(B) Explain under reinforced, balanced and over reinforced rectangular section also draw strain and stress diagram for singly reinforced rectangular section.

(C) Explain the term development length & derive expression for same

(D) Pressure line or thrust line in prestressed concrete

Q.2 (a) A reinforced concrete beam of rectangular cross section of size 230 mm width and 550 mm depth effective is reinforced with 3 bars of 16 mm diameter on tension side. Calculate the maximum stresses developed in concrete and steel when the simply supported beam carries audl of 11KN/m over an effective span of 6 meter. & use M20 Fe415 HYSD reinforcement. 8

(b) A R. C. beam of size 230 x 450 mm effective is reinforced with 2 bars of diameter 16 mm on compression side and 5 bars of 12 mm diameter on tension side placed at effective covers of 40 mm at top and 50 mm at bottom, respectively. Calculate the allowable moment of resistance of the section. Adopt M20 and Fe250 grade of concrete and steel. 10

(c) Define doubly reinforced beam. Enlist the situations under which it is adopted 2

Q.3 (a) Determine the moment of resistance of the T-beam use following data: b_f = 1000 mm, D_f = 100 mm, b_w = 300 mm, cover = 50 mm, d = 450mm and A_{st} = 1963 mm^2 Use M 20 and Fe 415. 12

(b) Design the shear reinforcement in a simply supported beam 230mm wide, 400mm effective depth carrying a u.d.l of 35 KN/m. The span of beam is 3m.The beam has main tension steel of 6 nos. Bar 16 mm dia Use M 20 /Fe 415.Value of permissible shear stress are given in table below. 08

(68)

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$100A_s/bd$	≤ 0.15	0.25	0.5	0.75	1.00	1.25	1.5	1.75
τ_{bd}	0.18	0.22	0.3	0.35	0.39	0.42	0.45	0.47

Q.4 (a) Design a one way slab with a clear span of 3.5m, simply supported on 150 mm thick masonry walls to support a live load of $3kN/m^2$. Adopt M20 concrete and Fe 415 steel. **10**

(b) Design a circular column provided with helical reinforcement to support an axial load of 1100 kN. The ends of column are restrained both in position and direction with an unsupported length of 6 m. The materials used are M20 and Fe250. **10**

Q.5 (a) Explain the design steps for axially loaded short columns **4**

(b) Explain kern of a section & safe cable zone in prestressed concrete. **4**

(b)An unsymmetrical I-section is used to support an imposed load of 2.5KN/m over a span of 7m, the sectional details are top flange 300mm wide & 60mm thick, bottom flange 100mm wide & 60mm thick. The thickness of web is 85mm and overall depth of beam is 400mm. It is subjected to effective prestressing force of 125KN located at an eccentricity of 55mm from the soffit of beam. Estimate the extreme stresses at top & bottom of beam for following conditions (i) prestress + self weight (ii) Prestress+ self weight + live load. Take density of concrete as $24KN/m^3$ **12**

Q.6 (a) A prestressed concrete beam of size 230mm * 450mm is prestressed with wires (area $300mm^2$) located at a constant eccentricity of 50mm and carrying an initial stress of $1200N/mm^2$, the span of beam is 10m. Calculate the percentage loss of stress in wires if (i) the beam is pretensioned (ii) the beam is post tensioned. Use the following data: Es = 210 KN/mm^2 and Ec= 35 KN/mm^2, relaxation of steel stress = 5% of initial stress, shrinkage of concrete = $300*10^{-6}$ for pretensioning and $200*10^{-6}$ for post-tensioning, Creep coefficient = 1.6, slip at anchorage= 1mm frictional co-efficient for wave effect = 0.0015/m **12**

(b)Why high strength concrete and steel is required in prestressed concrete **4**

(c) Explain load balancing concept with the help of neat sketches showing different cable profiles. **4**
