: LSMRCS

LSM Dec 10

50 : 2nd half.10-p(d)

Con. 6598-10.

GT-8722

(REVISED COURSE)

(3 Hours)

[Total Marks : 100

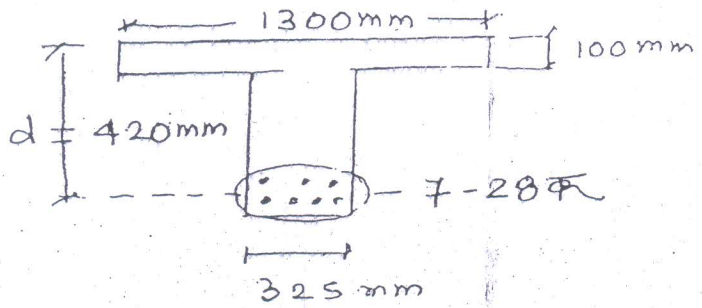
N.B. : (1) Question No. 1 is compulsory.
(2) Solve any four questions from remaining questions.
(3) Assume suitable data if required and state it clearly.

1. (a) What is meant by 'Limit state' ? Discuss different limit states to be considered in reinforced concrete design. 5
(b) Explain in detail 'under reinforced', 'balanced' and 'over reinforced' R.C. section with respect to Limit state method of design. 6
(c) Why is partial safety factor for concrete 'r_c' greater than that for reinforcing steel 'r_s' in the consideration of ultimate limit states ? 4
(d) Derive design stress block parameters for singly reinforced section for LSM of design, ultimate limit state, flexure. 5

2. (a) Calculate ultimate movement of resistance for R.C. section 230 mm × 600 mm depth overall and reinforced with 3–16 ϕ reinforcement. Grade of steel Fe 415. grade of concrete M 20. 5
(b) A R.C. beam of size 230 mm × 500 mm overall depth, is at span 6·0 Met. It is subjected to u.d.l. D.L + L.L. (service load) of 35 kN/m. Design reinforcement if grade at concrete is M 20 and grade of steel Fe 415. 15

$\frac{dc}{d}$	0·05	0·10	0·15	0·2
f_{sc} in MPa	355·1	351·9	342·4	329·2

3. (a) Explain in brief concept of equivalent flange thickness for analysis and design of R.C. T section. 4
(b) Determine the ultimate moment of resistance of T beam section as shown below. Grade of steel Fe 415 and grade of concrete M 20. 16



4. (a) Explain difference in the behaviour of one way and two way slab. 4
(b) Explain the difference between 'flexural bond' and 'development bond'. 4
(c) A two way slab 4·0 m × 5·0 m with two adjacent edges discontinuous is subjected to L.L. (service load) of 3·5 kN/m² and floor finish load of 1·0 kN/m² apart from its self weight. Design the slab and show reinforcement with appropriate sketch. Grade of concrete M 25, grade of steel Fe 415. Bending moment coefficients are as below :– 12

Negative moment at continuous edge short span = 0·0625
Negative moment at continuous edge long span = 0·047
Positive moment at mid span short span = 0·037
Positive moment at mid span long span = 0·37

[TURN OVER

5 (a) Explain in brief different types of shallow footings used. 5

(b) Design combined rectangular pad footing for following data– 15

Column A = size 230 × 500
Load 800 kN (service load)
Reinforcement – 6–16 Φ

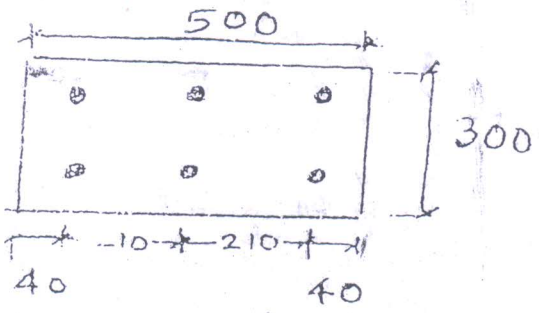
Column B = size 230 × 700
Load = 1150 kN (service load)
Reinforcement – 6 – 2 Φ.

S.B.C. of soil = 120 kN/m²
Width of footing = 1·5 m.

Distance centre to centre between column is 2·2 m. 2
Grade of concrete M 20, grade of steel Fe 415. Draw also sketch showing reinforcement details.

6 (a) Explain the difference between long columns and short columns. 3

(b) For the column section shown below, determine the design strength corresponding to limiting condition of 'no tension' in the section. Consider eccentricity of loading with respect to major axis only. Assume grade of concrete M 25, grade of steel Fe 415 17



6 - 20Φ Reinf.

For Fe 415

strain	stress (MPa)
0·0000	0·00
0·00144	288·7
0·00163	306·7
0·00192	324·8
0·00241	342·8
0·00273	351·8
≥ 0·00380	360·9

7 (a) A R.C. beam of span 5·0 m is subjected to D.L. of 30 kN/m and L.L. of 20 kN/m, using Whitney's stress block, design the beam using ultimate load method. Use appropriate load factor. 10

(b) Design shear reinforcement for a beam of span 6·0 m subjected to ultimate load of 60 kN/m. Size of beam is 230 × 800 mm and reinforcement in beam is 4 – 20 Φ bars 10

100 Ast/bd	0·5	0·75	1·0	1·25
τ_c N/mm²	0·48	0·56	0·62	0·67

Con. 6287-10. (REVISED COURSE) GT-8727

Dec. 2010

(3 Hours) [Total Marks : 100

N.B. (1) Attempt any five questions. Question No. 1 is compulsory.
(2) Assume suitable data if necessary and state them clearly
(3) Draw sketch wherever possible.

1. Solve any four :— 20
(a) Compare surface and subsurface irrigation.
(b) Explain the terms 'duty' and 'delta'. Derive a relationship between the two
(c) Explain the terms :—
Aquifer, aquiclude, aquifuge and aquitard
(d) Write short note on cross drainage works.
(e) Write short note on canal alignment.

2. (a) Determine reservoir capacity for :— 10
Command area of 40000 ha, canal losses = 10% and reservoir losses = 10% and the following data :—

Crop	Base period (days)	Outlet factor (ha/cumec)	Irrigation intensity (%)
Sugarcane	360	1700	20
Cotton	180	1500	10
Wheat	120	1800	20
Rice	120	700	15
Vegetables	120	700	15

(b) Describe various methods of computing average rainfall over a basin 10
their merits and demerits.

3. (a) The average monthly inflow into a reservoir in a dry year is given below :—

Month	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Mean Monthly Flow (m^3/s)	20	60	200	300	200	150	100	90	60	50	30	

If a uniform discharge at 90 m^3/s is desired from this reservoir what minimum storage capacity is required ?

(b) A 3-h unit hydrograph for a basin has the following ordinates. Using the S curve method, determine the 9-h unit hydrograph ordinates 10

Time (h)	0	3	6	9	12	15	18	21	24	27	30
Discharge (m^3/s)	0	12	75	132	180	210	183	156	135	144	96

Time (h)	33	36	39	42	45	48	51	54	57	60
Discharge (m^3/s)	87	66	54	42	33	24	18	12	6	0

[TURN OVER

Negative moment at continuous edge short span = 0.062
Negative moment at continuous edge long span = 0.047
Positive moment at mid span short span = 0.037
Positive moment at mid span long span = 0.37

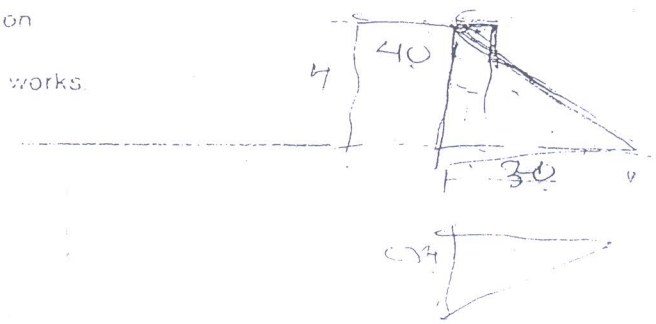
[TURN OVER

4. (a) The following observations were made on a 300 mm diameter well penetrating an unconfined aquifer :—
   (i) Rate of pumping = 1800 lit/min
   (ii) Drawdown in a test well 30 m away = 1·8 m
   (iii) Drawdown in a test well 60 m away = 0·6 m
   (iv) Depth of water in the well before pumping = 50 m
   Determine the radius of the circle of influence and the coefficient of transmissibility of the aquifer.
   (b) Describe in brief various investigations required for reservoir planning. 10

5. (a) A triangular section gravity dam 40 m high has water stored up to top and base width 30 m. Analyse the dam section to determine :— 12
   (i) factor of safety against sliding
   (ii) factor of safety against overturning
   (iii) there is no tension anywhere along the base of dam and
   (iv) maximum compressive stress in the dam body is within safe crushing strength of the material (10 kg/cm^2).
   Assume coefficient of friction between the base and foundation is 0·7 and uplift pressure intensity coefficient is 0·45.
   (b) Explain with the help of diagrams various joints and water seals provided in gravity dams. 8

6. (a) Discuss design consideration for earth dams in earthquake regions. 10
   (b) What are different types of arch dams ? Discuss their salient features. 10

7. Write short notes on : — 20
   (a) Ski-jump bucket
   (b) Bandhara irrigation
   (c) Lining of canals
   (d) Canal regulation works.



Con. 5657-10.

Dec. 2010

GT-8724

(REVISED COURSE)

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is compulsory.
(2) Attempt any four questions out of remaining six questions.
(3) Assume any suitable data if required and state the same clearly.
(4) Use of IS 1343-1980 is permitted.

1. (a) Why is necessary of using high strength concrete and high tensile steel in prestressed concrete. 5
(b) List the various types of loss of prestress in pretensioned and post tensioned members. 4
(c) What are concordant cables ? Sketch a typical concordant cable profile in a two span continuous prestressed conc. beam. 5
(d) Discuss briefly the limitation of prestress in members having long spans with relatively large dead load bending moments. 6

2. A prestressed beam has an unsymmetrical I section with an overall depth of 2000 mm. The top and bottom flange width are 1800 mm and 850 mm respectively. The thickness of top flange 200 mm, and bottom flange 400 mm, thickness of web 200 mm. The beam is designed for simply supported span of 40 m. The permissible comp. stress at the transfer and working load is limited to 16 N/mm^2, while the tensile stress at the transfer and working load is limited to zero and 1·4 N/mm^2 respectively the loss ratio is 0·8. 20
Calculate :
(i) the permissible uniforming distributed imposed load.
(ii) the magnitude of the prestressing force if at the mid-span section it is located 130 mm from the soffit. and
(iii) the vertical limits within which the cable must lie at mid span.

3. (a) The deck slab of road bridge of span 10 m is to be designed as a one way prestressed conc. slab with parallel post tensioned cables in each of which the force at transfer is 500 kN. If the deck slab is required to support a uniforming distributed live load of 20 kN/m^2. with the comp. and tensile stress in conc. at any stage not exceeding 15 N/mm^2 and zero N/mm^2 respectively. Calculate the max. horizontal spacing of the cables and their positions at the mid span section. Assume the loss ratio as 0·8. 10
(b) A post tensioned beam of rectangular c/s, 200 mm wide and 450 mm deep, is 8 m long and carries an applied load of 10 kN/m uniformly distributed on the beam the effective prestressing force in the cable is 500 kN. The cable is parabolic with zero eccentricity at the suppports and a maximum eccentricity of 140 mm at the centre of span. 10
(i) Calculate the principal stresses at the supports.
(ii) What will be the magnitude of the principle stresses at the supports in the absence of prestress.

4. (a) A simply supported beam with a uniform section spanning over 6 m is post tensioned by two cables, both of which an eccentricity of 100 mm below the centroid of the section at mid span. The first cable is parabolic and is anchored at an eccentricity of 100 mm above the centroid at each end, the second cable is straight and parallel to the line joining the supports. The c/s area of each cable 150 mm^2. and they carry an initial stress of 1000 N/mm^2. The conc. has a c/s of 2×10^4 mm^2 and radius of gyration of 150 mm. The beam supports two conc. loads of 20 kN each at the third points of the span E_c = 38 kN/mm^2. Calculate using Lin's simplified method. 10
(i) the instantaneous deflection at the centre of span.
(ii) the deflection at the centre of span after 2 years, assuming 20% loss in prestress and effective modulus of elasticity = 1/3 E_c.

[TURN OVER

(b) The end block of a prestressed beam, 200 mm wide and 300 mm deep has two Freyssinet anchorages (100 mm ϕ) with their centres at 75 mm from the top and bottom of the beam. The force transmitted by each anchorage being 300 kN. Detail the maximum tensile stress and the bursting tension developed. 5

5. (a) A prestressed concentration beam having size 230 × 450 mm is prestressed with wires (area = 300 mm^2) located at a constant eccentricity of 50 mm and carrying an initial stress of 1200 N/mm^2 the span of beam is 10 m. Calculate the percentage loss of stress in wires if— 12

(i) beam is pre-tensioned and

(ii) the beam is post-tensioned.

Using the following data :

E_s = 210 kN/mm^2 and E_c = 35 kN/m^2

Relaxation of steel stress = 5% of the initial stress.

Shrinkage of conc. = 300 × 10^{-6} for pretensioning and 200 × 10^{-6} for post tensioning

Creep coefficient = 1·6

Slip at anchorage = 1 mm

Frictional co-efficient for wave effect = 0·0015/m.

(b) A rectangular conc. beam 250 mm wide by 300 mm deep is prestressed by a force of 500 kN at a const. eccentricity of 60 mm. The beam supports a conc. load of 75 kN. at the centre of span of 3 m. Det. the location of the pre-line at the centre, quarter span and supporting sections of the beam. Neglect the self wt of the beam. 8

6. (a) A rectangular conc. beam of cross section 200 mm × 300 mm deep is prestressed by means of 15 wires of 5 mm dia located 70 mm from the bottom of the beam and 3 wires of dia of 5 mm, 25 mm from the top. Assuming the prestress in the steel as 1000 N/mm^2, calculate the stressed at the extreme fibres of the mid span section when the beam is supporting its own weight over a span of 6 m. If uniformly distributed live load of 6 kN/m is imposed. 10

(b) Explain concept of load balancing.

(c) Determine the efficiency of 'T' section, width of flange 200 mm, thickness 20 mm, depth of web = 150 mm and thickness 20 mm. 4 6

7. Det. equivalent upward load and hence locate pre. line. Is it concordant cable, if not, make it concordant by linear transformation. A beam is symmetrically prestressed by a parabolic cable carrying 2500 kN P.F. 20