Registration No: | | | | | | | | | | |

Total Number of Pages: 04 **M.TECH.**
P2SUCC01

2nd Semester Regular Examination 2016-17
Advanced Reinforced Concrete Design
BRANCH: STRUCTURAL & FOUNDATION ENGG, STRUCTURAL ENGG
Time: 3 Hours
Max Marks: 100
Q.CODE: Z348

Answer Question No.1 which is compulsory and any FOUR from the rest. The figures in the right hand margin indicate marks. Use of IS 456:2000 is allowed for use. The question includes one extra page (Interaction Curve Sheet) for use during exam.

Q1 Answer the following questions: ***Short answer type*** **(2 x10)**

a) For design of RCC beam/slab, which type of section (under reinforced, balanced or over reinforced) is prescribed by IS code and why ?
b) Describe the behavior of over reinforced section.
c) How *flexure shear crack* differs from *diagonal tension crack* ?
d) What is the difference between *shear tension failure* and *shear compression failure* ?
e) What is *compatibility torsion* ?
f) What is the *lateral drift effect* in a slender column ?
g) What is *long term deflection* ? How does it differs from *short term deflection* ?
h) What is *yield line* ?
i) What do you mean by limit analysis of RCC beam ?
j) What is tension stiffening effect ?

Q2 Design a simple supported beam of length 6.5 m (center to center of supports of width 250 mm) with live load 20 kN/m & dead load of 7.5 kN/m and a concentrated load of 25 kN at centre for severe exposure conditions . Consider HYSD Fe 500 steel for the beam cross section 250x450. **(20)**

Stress-strain table for Fe 500 Steel

Strain	Stress
0	0
0.00174	347.8
0.00195	369.6
0.00226	391.3
0.00277	413.0
0.00312	423.9
> or = 0.00417	434.8

Q3 Design the slab of clear span 4.0 mx 8.5 m supported on masonry walls of 250 mm width and calculate the long term deflection due to shrinkage and creep. Apply the code checks on the total deflection with the following data: **(20)**

ultimate shrinkage strain ε_{cs}=0.0004 , ultimate creep coefficient θ=1.6, fy=500 MPa, ,live load =4 kN/sqm, surface finish=0.5 kN/sqm, severe exposure condition

Q4 Using interaction diagrams, find the actual total moments for a braced column 300 mm x 400 mm subjected to a factored axial load of 1600 kN and factored moments of 50 kNm and 25 kNm with respect to the major axis and minor axis respectively at the top end ? Assume that the column is bent in double curvature (in both directions) with the moments at the bottom end equal to 50% of the corresponding moments at top. The unsupported length of column is 6.5 m and effective length ratio is 0.85 in both directions . **(20)**

Use M25 concrete and Fe 415 steel.

Q5 a) By yield line theory, design a simply supported rectangular slab with unrestrained corners and clear spans of 3.5 and 5 m which is subjected to a live load of 4 kN/sqm. Take Fe 500 steel and severe exposure condition . **(10)**

b) By yield line theory,design a square slab of 5 m clear span with unrestrained corners and fixed boundary which is subjected to a live load of 3 kN/sqm. Take Fe 500 steel and moderate exposure condition. . **(10)**

Q6 Design a three span continuous beam of equal spans 7.0 m (simply supported at both ends) subjected to dead load including self weight 20 kN/m and live load 15 kN/m by applying moment redistribution as per IS code ? Take moderate exposure condition and Fe 500 steel. **(20)**

Q7 a) Calculate the maximum probable crack width for the one-way slab of clear span 4 m, simply supported on 250 mm thick masonry walls, subjected to a live load of 3 kN/sqm and surface finish of 0.5 kN/sqm by IS method with the following data: **(10)**

D =200 mm
Steel provided 10 mm dia @ 150 mm c/c
Fe 500 steel , fck= 30 MPa
Severe exposure condition

b) By yield line theory, design a rectangular slab of 3m x 5 m clear span with unrestrained corners and fixed boundary which is subjected to a live load of 3 kN/sqm. Take Fe 415 steel and mild exposure condition. **(10)**

Chart 45 COMPRESSION WITH BENDING—Rectangular Section—Reinforcement Distributed Equally on Four Sides

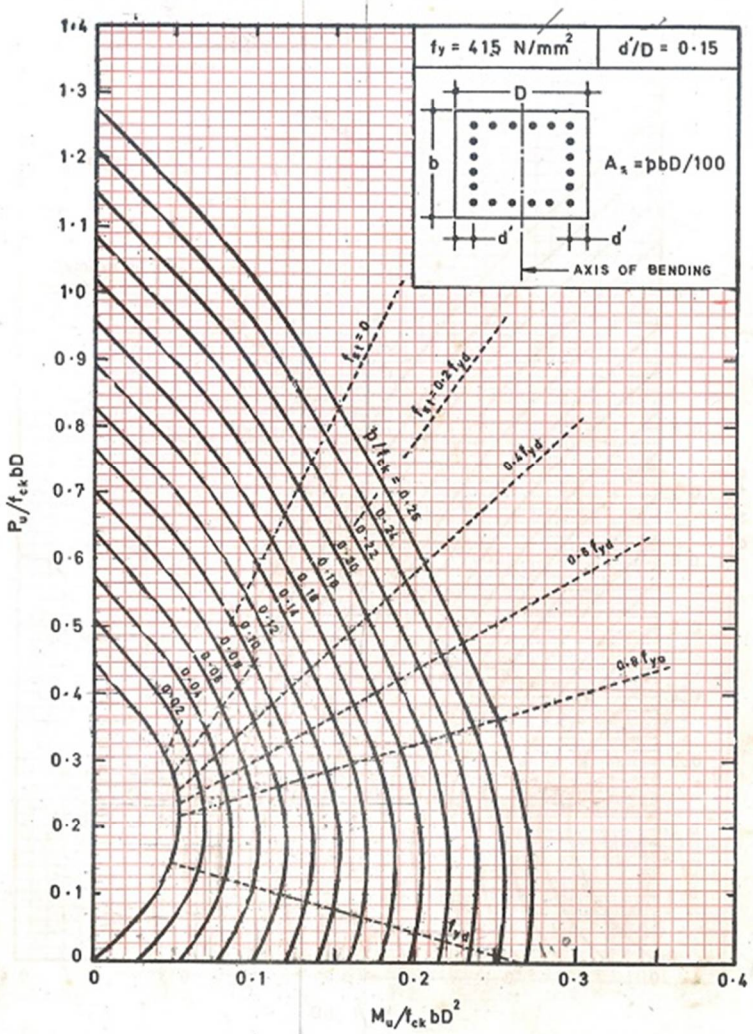

Chart 46 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Four Sides