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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION

Civil Engineering

(Geomechanics and Structures)

04 CE 6307 Advanced Design of Concrete Structures

Max. Marks : 60 Duration: 3 Hours

Answer all Questions
Use of IS-456-2000 and Interaction curves are permitted.
Assume suitable data wherever necessary

Part A

1. Distinguish between short and long term deflection.
2. What are yield lines? State the characteristic features of yield line.
3. Explain the design principles of braced RC walls with vertical load.
4. What are the assumptions made in the portal method of analysis of frame subjected to lateral loads?
5. Explain the curvature of a member at section with reference to a figure. Draw moment (M) and curvature (ϕ) for a singly reinforced beam section.
6. Explain plastic hinge rotation capacity with reference to a simply supported beam with point load at mid span.
7. What are the assumptions made in Baker's method for plastic analysis of beams?
8. Write a brief note on fire resistance of structural members

(8x3=24 marks)

Part B

9(a) Design a biaxially eccentrically loaded braced rectangular column for the following data.

Ultimate axial load= Pu= 1500KN
Ultimate biaxial moments=Mux=60kNm, Muy=40kNm
Assume an unsupported length of 7m and an effective length ratio of 0.85 in both directions.
Column section 300mmx400mm.
Use M30 and Fe 415 steel.

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OR

9(b) Design a simply supported deep beam with clear span of 5m and width of bearing=500mm at each end. Depth of deep beam D=3500mm and thickness t=250mm. Assume concrete of Grade M20 and steel of grade Fe415.

10(a) Design a rectangular slab 4mx6m in size and fixed at edges for a service load of 4KN/m^2, μ=0.7=long span moment/short span moment. fck=20N/mm^2 and fy=415N/mm^2.

OR

10(b) A walkway consists of a slab 5.4m between edges supported on spandrel beams 200mmx600mm in size which in turn is carried on 360x200mm columns spaced at 7m c/c. Assuming the factored load on the walkway is 6KN/m^2 and slab thickness is 150mm. Determine the design torsion moment in the spandrel (edge) beam and walkway slab.

11(a) Define shear wall. Classify different types of shear walls with sketches. Explain the design principles of rectangular and flanged shear walls.

OR

11(b) Design a reinforced concrete wall of height 5m which is restrained in position and direction at both ends and has to carry at its top a factored load PU=600KN and factored moment Mu=25KNm at right angles to the plane of wall. Provide suitable reinforcements. Assume fck=20N/mm^2 and fy=415N/mm^2.

12(a) Analyse the intermediate frame of a multi storey building spaced at 4m c/c . L.L =4kN/m^2 , D.L on panels AB,BC and CD are 3 kN/m^2 ,3.25 kN/m^2 and 2.75 kN/m^2. Self weight of the beam may be taken as 5kN/m, 2.5kN/m and 3.5kN/m for AB,BC and CD respectively. Relative stiffness of AB,BC and CD are 4.5k,2k and 3k respectively. Relative stiffness of the columns from the upper storey to the lower storey are 2k,2.5k,2.5k and 3k. AB = 7m,BC= 3.5m and CD = 5m. Storey height 3.5m.

OR

12(b) Analyse the building frame subjected to horizontal forces shown in fig. Use cantilever method.

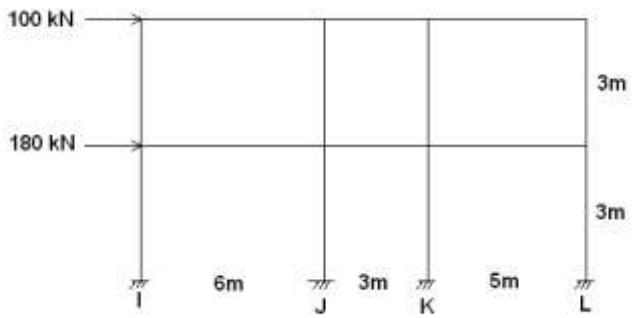

Fig. ii

For the second storey calculate;

I. Moments at the end of columns
II. Axial forces in columns
III. Shear at the ends of beam.

13(a) Explain in detail moment curvature or moment rotation relationship of a flexural member. Also explain redistribution of moments. What are the IS code provisions for the limit analysis of RC structures.

OR

13(b) A single reinforced beam is made up of concrete grade M20 and Fe 415 steel. Width of section is 300mm, effective depth=d=570mm. tension reinforcement Ast= 4 nos 16 mm dia. The beam is provided with 6 mm dia 2 legged closed stirrups at a spacing of 150mm c/c. concrete cover on stirrups 15mm. if a tensile plastic hinge forms in the beam, estimate its rotation capacity. Distance of point of contra flexure from section= 1.23m.

14(a)Following are the details of an internal beam column joint of type (1) joint, subjected to reversals which are not due to earthquake.
Column: 600mm x 600mm with 8nos 25 mm dia bars. Column factored load is 1400KN, Storey height=3m.
Beams on either side are 400mm x 500mm with 4 nos of 28 mm dia (1846mm^2) at top and 4 nos of 25 mm dia (at bottom) (1473mm^2).

Assume fck = 25 N/mm2 fy= 415 N/mm2. Design the joint with respect to strength, stability and shear.

OR

14(b) Explain strengthening of RC structures.

(6 x 6=36 marks)