Full Marks: 70   **Time: 3 hours**
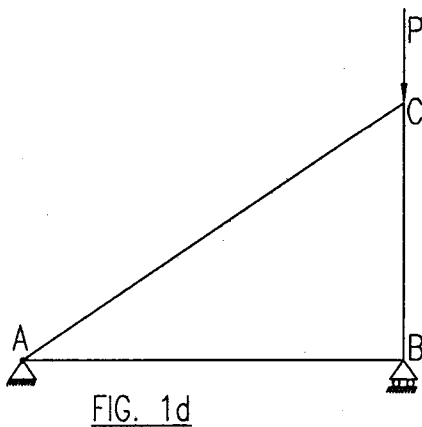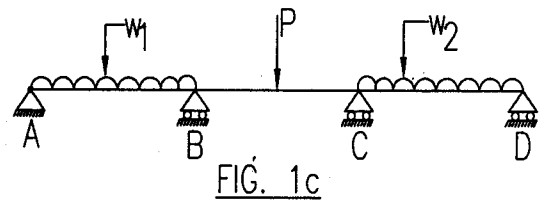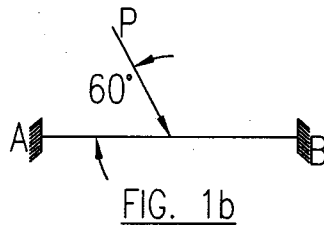
FIRST HALF

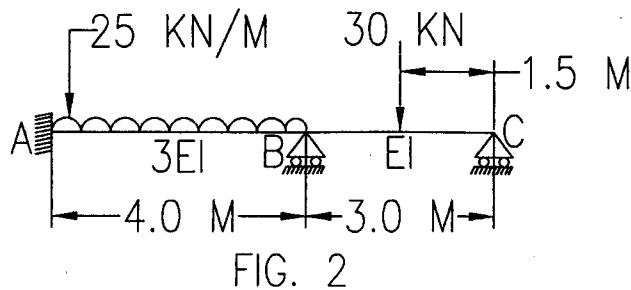### (Answer question no.1 and any TWO from the rest in 1st half)

1. Check whether the following structures are determinate or indeterminate and find the degree of indeterminacy for the indeterminate structures: 3 x5=**15**

FIG. 1a   FIG. 1b   FIG. 1c

FIG. 1d   FIG. 1e
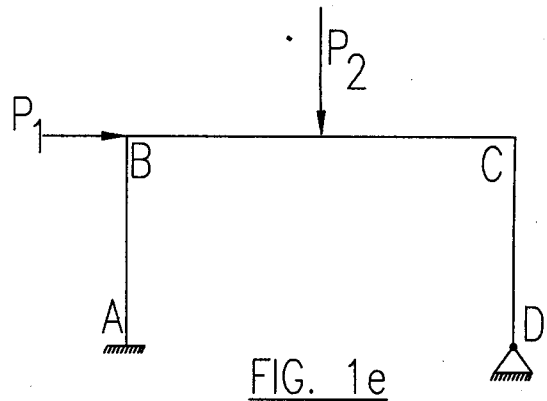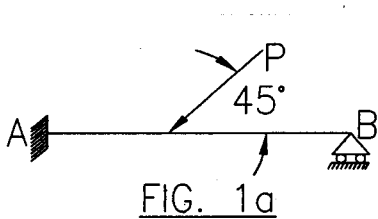
2. Analyze the two span beam by Moment Distribution Method and draw the Bending Moment diagram: **10**

FIG. 2

3. Find the forces in all members of the truss: **10**
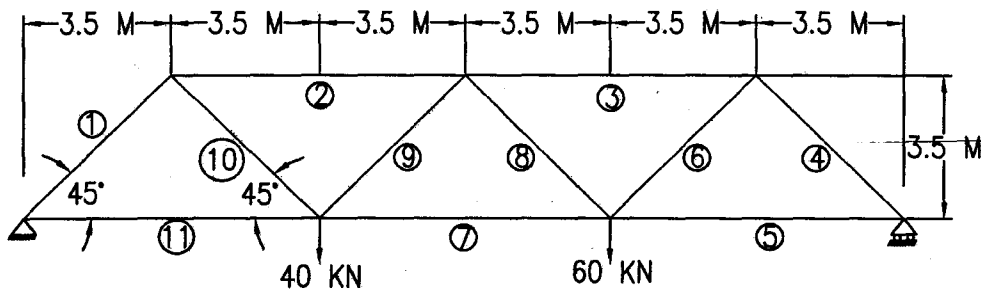
FIG. 3

4. Draw the Axial Force diagram, Shear Force diagram and Bending Moment diagram of the portal frame shown in Fig-4:   **10**
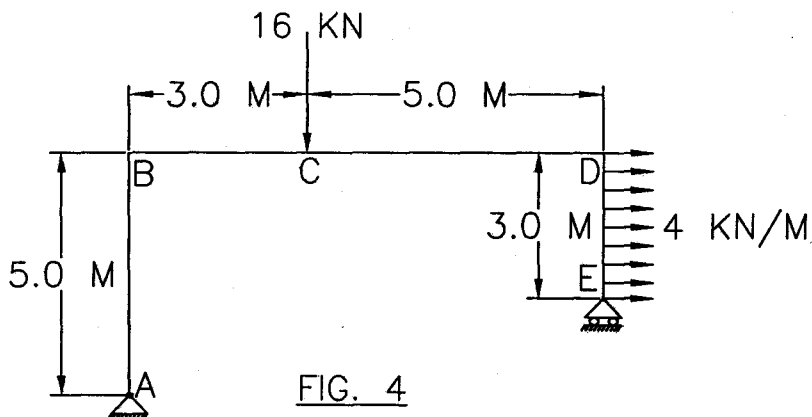

FIG. 4

5. a) Differentiate among truss members, beam members, column members and portal frame members.

    b) Draw some of the common types of roof trusses.

    c) Explain stiffness factors, distribution factors and carry over factors.

                                               4+3+3=**10**

SECOND HALF

*(Answer any **THREE** questions)*
Two marks are reserved for neatness.
Assume any suitable data, if necessary.

6. A floor slab of a room is supported on all four discontinuous supported edges of 300mm thick with corners prevented from lifting. The inside dimensions are 3300mm x 4800 mm. and live load on slab may be taken as 2.5 kN/m^2. Use M20 Grade Concrete and Fe 415 steel. Design the slab using Limit State Method (L.S.M) & show the reinforcement details. Take moment coefficients along shorter & longer directions are (+)0.078 & (+)0.060, respectively.   **11**

7. Design a simply supported rectangular R.C. beam for effective span of 6m to support live load of 8 kN/m using LSM. The width of the beam may be kept as 300 mm. Use M20 concrete and Fe 415 steel bars.   **11**

8. Design the reinforcements in a rectangular column of size 300mm by 400 mm to support a design ultimate load of 800kN together with a factored moment of 200 kNm. Use M20 concrete and Fe 415 steel bars. (Assume, p/f_{ck}= 0.08).   **11**

9. Find out the sizes of a trapezoidal combined footing for two columns A (400 mm x 400mm) and B (600mmx600mm) carrying loads of 1500kN and 2500kN respectively and placed 5m apart. The property lines are 500 mm from the face of column A and 800mm from the face of column B. The safe bearing capacity of soil is 100 kN/m^2. Use M25 concrete and Fe 415 steel bars.   **11**

10. a) What are the different types of flat slabs?
    b) Discuss about the differences between floor slab and flat slab.
    c) What are the limitations of Direct Design Method for designing of flat slabs?
                                                                          3+3+5=**11**