# 22402

*Instructions* – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1.**   **Attempt any  FIVE of the following:**                                  **10**

a) Define core of section.

b) State the condition for no tension in the column section.

c) State expressions for deflection of simply supported beam carrying point load at mid span.

d) State the values of maximum slope and maximum deflection for a cantilever beam of span 'L' carrying a point load 'W' at the free end. EI = constant.

e) Compare a simply supported beam and a continuous beam w.r.t. deflected shape of beam.

f) Write the values of stiffness factor for beams

(i)   Simply supported at both ends

(ii)  Fixed at one end simply supported at other end.

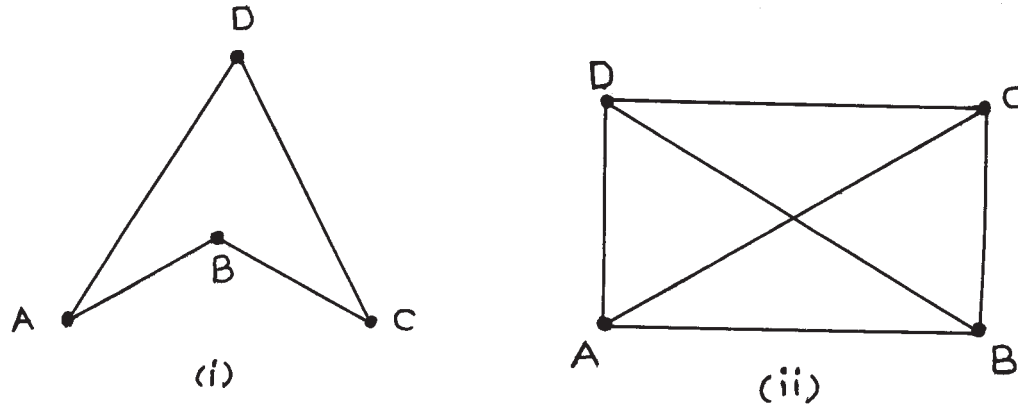g) Make the following trusses perfect by adding or removing the members, if required as shown in Fig. No. 1.



**Fig. No. 1**

**2.** **Attempt any THREE of the following:** 12

a) Explain the effect of eccentric load with sketch w.r.t. stresses developed.

b) Explain with expression four conditions of stability of dam.

c) Calculate maximum and minimum stresses at base of a rectangular column as shown in Fig. No. 2. It carries a load 200 kN at 'P' on the outer edge of a column. Draw stress distribution diagram.
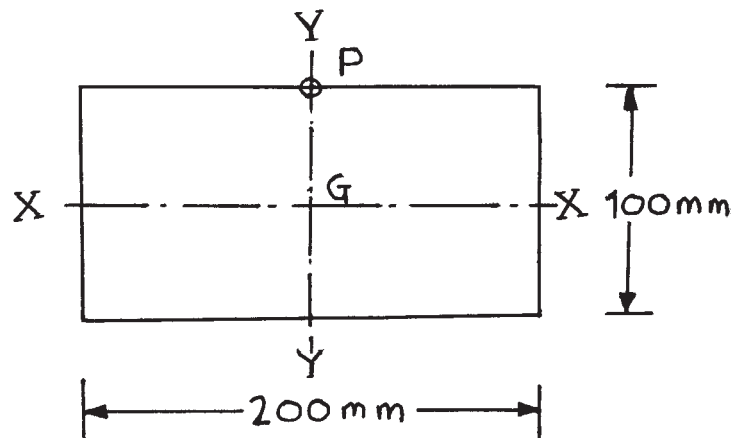


**Fig. No. 2**

d) Calculate the values of direct stress and bending stress at the base of chimney. Write interpretation of obtained values of stresses. Use following data.

(i) External diameter=3m

(ii) Internal diameter=2m

(iii) Height of chimney=44m

(iv) Weight of masonry=20 $kN/m^3$

(v) Co-efficient of wind resistance=0.60

(vi) Wind pressure=1$kN/m^2$

**3.**　　**Attempt any THREE of the following:**　　**12**

a) Calculate deflection under point load of a simply supported beam as shown in Fig. No. 3. Take EI=constant. Use Macaulay's method.
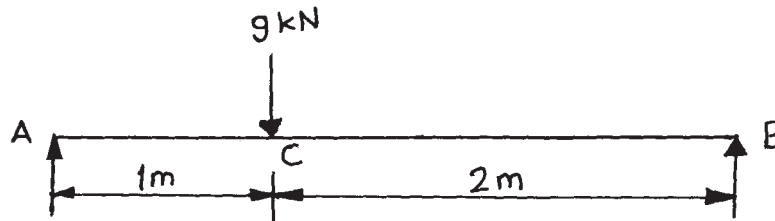
9 kN

A ——————————— B
　　1m　　C　　　2m

**Fig. No. 3**

b) Calculate fixed end moments and draw BMD for a fixed beam as shown in Fig. No. 4.

20 kN　　　　32 kN

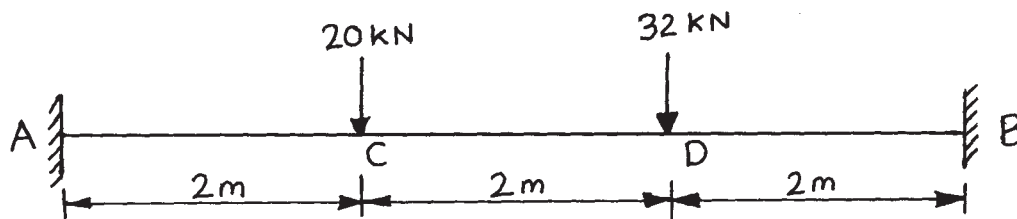A ——————————————— B
　　2m　　C　　2m　　D　　2m

**Fig. No. 4**

**Marks**

c) Calculate fixed end moments and draw BMD for a beam as shown in Fig. No. 5. Use first principle method.
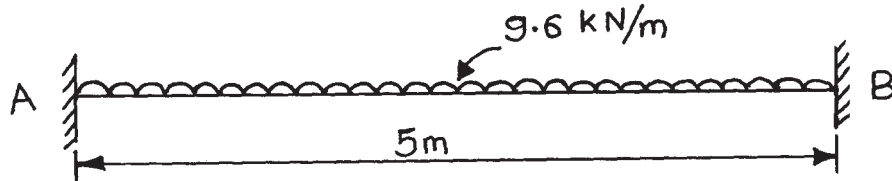


**Fig. No. 5**

d) (i) Explain with sketch the effect of fixity on bending moment of a beam and

    (ii) State two advantages of fixed beam over simply supported beam.

**4.**     **Attempt any <u>THREE</u> of the following:**     **12**

a) State Clapeyron's theorem of three moments for continuous beam with same and different EI.

b) Draw SFD for a continuous beam as shown in Fig. No. 6. having negative bending moment at support 'B' equal to 66.14 kN-m.
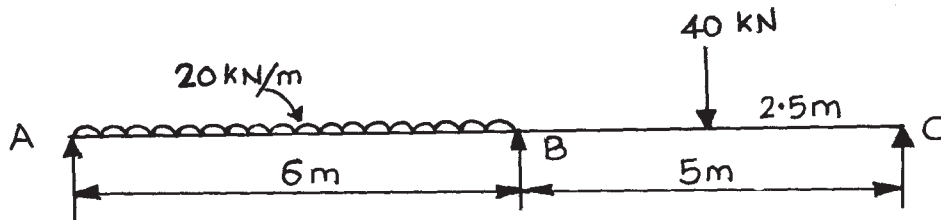


**Fig. No. 6**

**Marks**

c) Calculate distribution factors for the members OA, OB, OC, and OD for the joint 'O' as shown in Fig. No. 07.
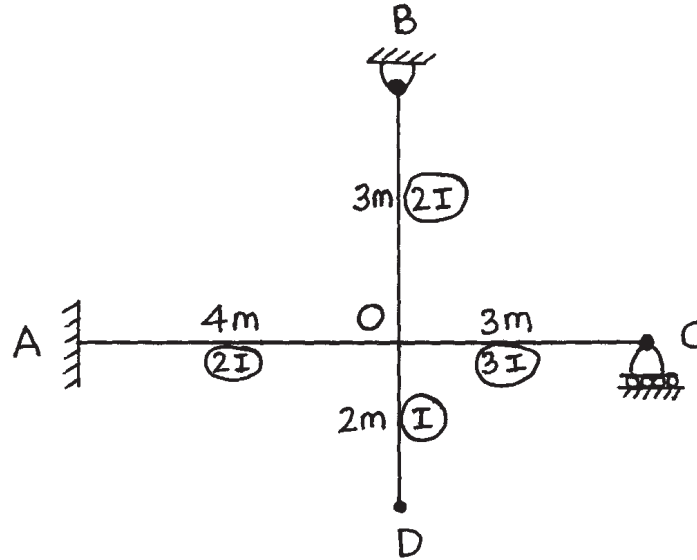


**Fig. No. 7**

d) Calculate support moments and draw BMD of a beam as shown in Fig. No. 8. Use moment distribution method.
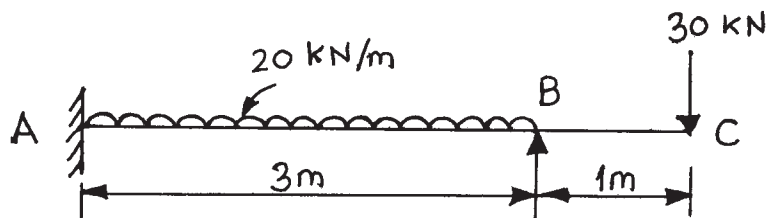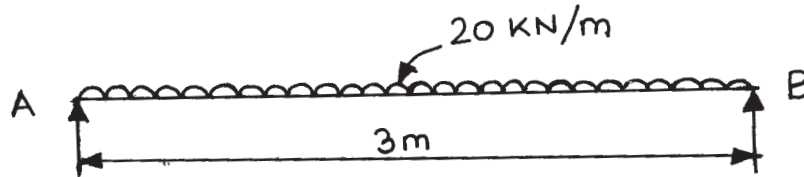


**Fig. No. 8**

e) Draw one sketch each of the following:

(i) Deficient frame

(ii) Redundant frame

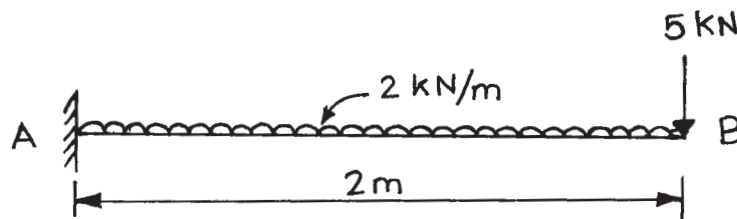(iii) Symmetrical portal frame

(iv) Unsymmetrical portal frame.

**Marks**

**5. Attempt any TWO of the following:**      **12**

  a) Calculate maximum deflection of a simply supported beam as shown Fig. No. 9. Take $E=200GPa$, $I=2\times10^8$ mm$^4$.
Use Macaulay's method.



**Fig. No. 9**

  b) Calculate maximum slope and maximum deflection of a cantilever beam as shown in Fig. No. 10.
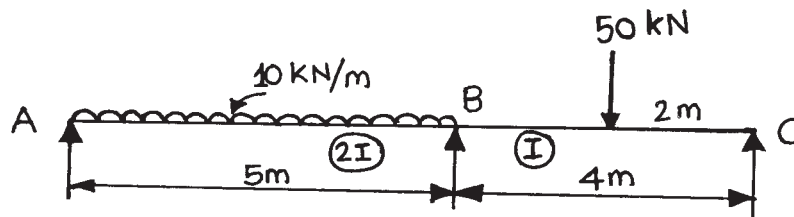


**Fig. No. 10**

Take $E=100$ GPa. Beam having width $100\,$mm and depth $200\,$mm in cross-section, Use standard formula.

  c) Calculate support moments for a beam as shown in Fig. 08.
on page no. 5 Q. 4(d).
Use three moment theorem.

**6. Attempt any TWO of the following:**      **12**

  a) Calculate support moments for a beam as shown in Fig. 11.
Use Moment distribution method.



**Fig. No. 11**

b) Calculate magnitude and state the nature of forces in the members AB, BC, CD, DE, BD, and BE of a truss as shown in Fig. No. 12. Use method of section.
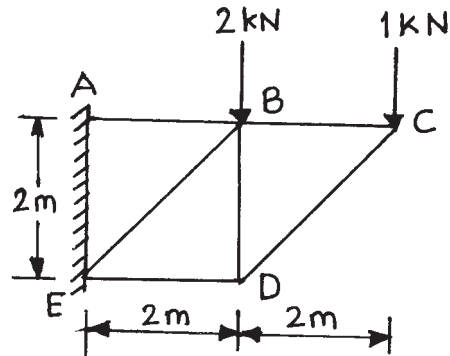


**Fig. No. 12**

c) Calculate magnitude and state the nature of forces in the members AB, BC, CD, AD and BD. of a truss as shown in Fig. No. 13. Use method of joints.
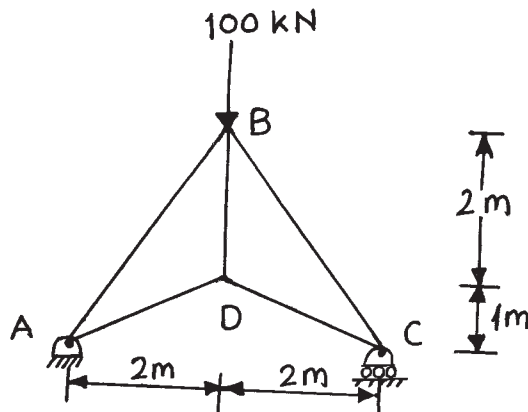


**Fig. No. 13**

_____