

Total No. of Questions—8]

[Total No. of Printed Pages—5

Seat No.	
-------------	--

[5459]-102

S.E. (Civil) (First Semester) EXAMINATION, 2018

STRENGTH OF MATERIALS

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Neat diagrams must be drawn wherever necessary.

(ii) Figures to the right indicate full marks.

(iii) Use of electronic pocket calculator is allowed.

(iv) Assume suitable data, if necessary.

(v) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4,
Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

1. (a) Determine load 'P' and total elongation of the bar. Refer Figure 1.1. Assume $E = 200 \text{ GPa}$. [6]

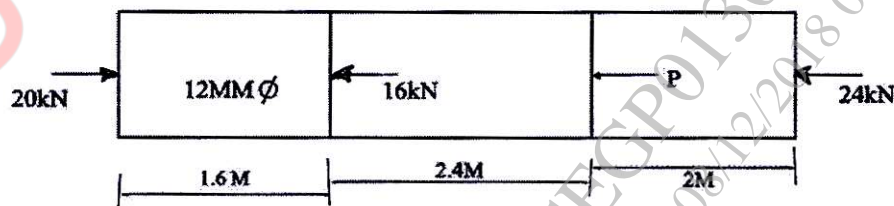


Fig. 1.1

P.T.O.

- (b) A beam of cross section $100 \text{ mm} \times 200 \text{ mm}$ is simply supported at both ends. It carries two concentrated loads of 100 kN each acting at 2 m distance from each support. Span of the beam is 7 m . Determine the maximum bending stress induced in the beam. [6]

Or

2. (a) A reinforced concrete column $500 \text{ mm} \times 500 \text{ mm}$ in section is reinforced with 4 steel bars of 25 mm diameter one in each corner. The column is carrying a load of 1000 kN . Find the stresses in the concrete and steel bars. Take E for steel = 210 GPa E for concrete = 14 GPa . [6]

- (b) A timber beam of rectangular section is simply supported over a span of 5 m and carries a uniformly distributed load of 3 kN/m over the entire span. If the maximum shear stress is 7 MPa . If $b = 2/3d$, find value of b and d . [6]

3. (a) A solid aluminum shaft 100 mm diameter is to be replaced by a hollow steel shaft having 100 mm outer diameter. The two shafts have same angle of twist per unit torque over the total length if shear modulus for steel = $3 \times$ shear modulus for aluminum. Find the inner diameter of the shaft. [6]

- (b) Draw Mohr's circle for :

- (1) pure shear
- (2) pure biaxial tension
- (3) pure uniaxial compression
- (4) pure uniaxial tension. [6]

Or

4. (a) A bar of 35 mm diameter stretches 3 mm under gradually applied load of 65 kN. If a weight of 2 kN is dropped on to a collar at the lower end of this bar through a height of 40 mm. Calculate maximum instantaneous stress and elongation of bar. Assume $E = 200 \text{ GPa}$. [6]
- (b) A bar of steel is 80 mm in diameter and 550 mm long. A tensile load of 100 kN is found to stretch the bar by 0.25 mm. The same bar when subjected to a torque of 1.4 kNm is found to twist through 3° . Find the values of four elastic constants. [6]

5. (a) Draw SFD and BMD for a simply supported beam as shown in figure 5.1. [7]

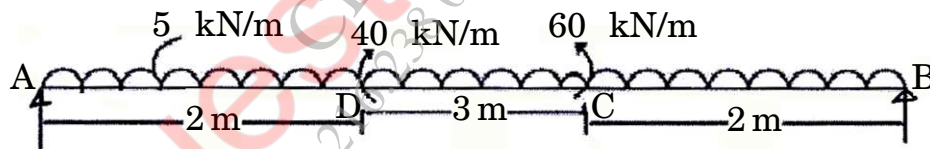


Fig. 5.1

- (b) Draw shearing force and bending moment diagram for the beam as shown in Fig. 5.2. Make maximum BMD. [6]

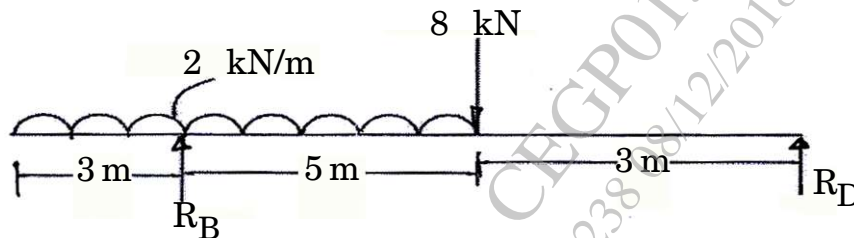


Fig. 5.2

Or

6. (a) An overhang beam ABCDE is supported at A and D. DE = 1 m overhang BC = CD = 1 m, AB = 2 m. Position AB is subjected to UDL 16 kN/m. At C a point load of 20 kN is acting. At E a point load 8 kN is acting. Draw SFD and BMD. Locate point of contraflexure. Calculate maximum Bending moment. Refer figure 6.1. [7]

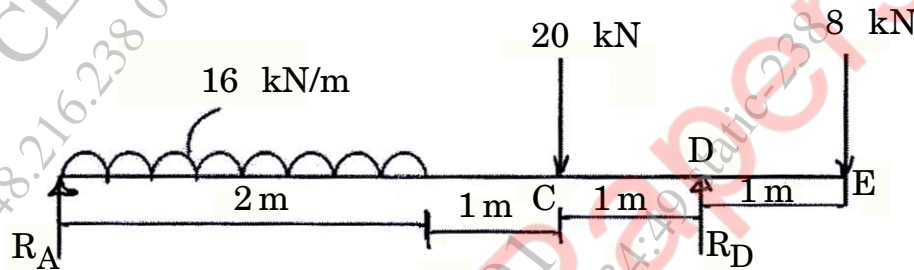


Fig. 6.1

- (b) The diagram shown in figure, shear force diagram for a beam which rests on two supports. Draw loading and bending moment diagram. [6]

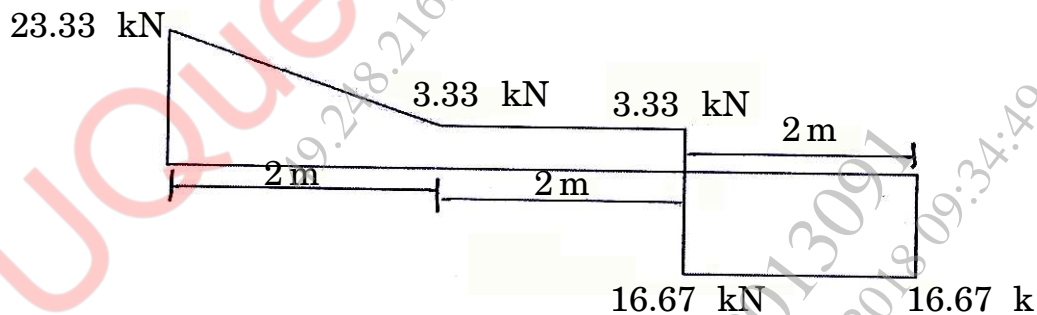


Fig. 6.2

7. (a) State four end condition of columns and draw neat sketches showing deflected shape and effective length. [6]

- (b) A 4 m length of a tube has a buckling load of 2 kN when used as a column hinged at both ends. Calculate buckling load for 4.5 m length of the same tube when used as column if :
- (1) both ends are fixed
 - (2) one end fixed and other is hinged. [7]

Or

8. (a) Explain core of the section and hence obtain a core section for hollow rectangular column of external and internal size $B \times D$ and $b \times d$ respectively. [7]
- (b) A column support load of 400 kN is shown in figure. Find the stresses at the corner of the column at its base. (Refer in figure 8.1) [6]

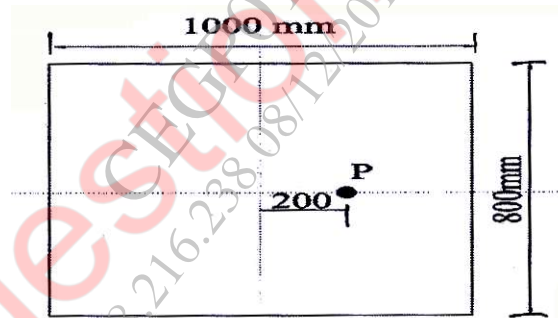


Fig. 8.1