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 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.l. Assume E = 200 GPa. [6]

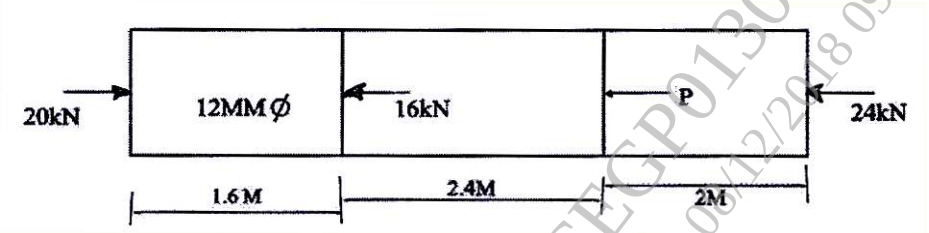

Fig. 1.1

P.T.O.

(*b*) A beam of cross section 100 mm × 200 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 mm × 500 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 havrng 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 × 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 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 3º. 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]

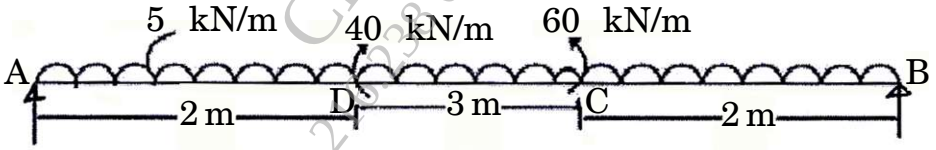

Fig. 5.1

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

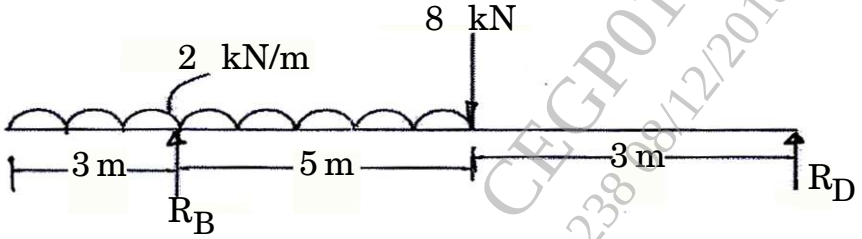

Fig. 5.2

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]

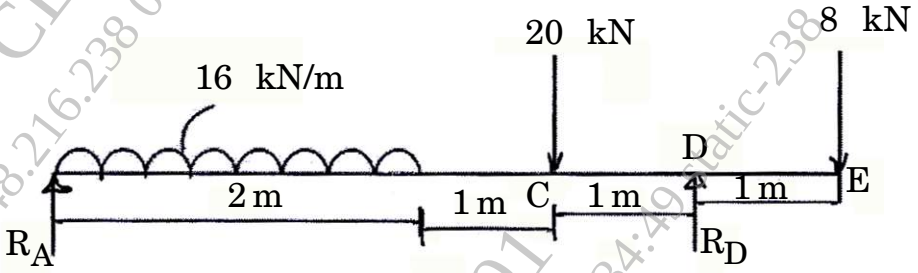

Fig. 6.1

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

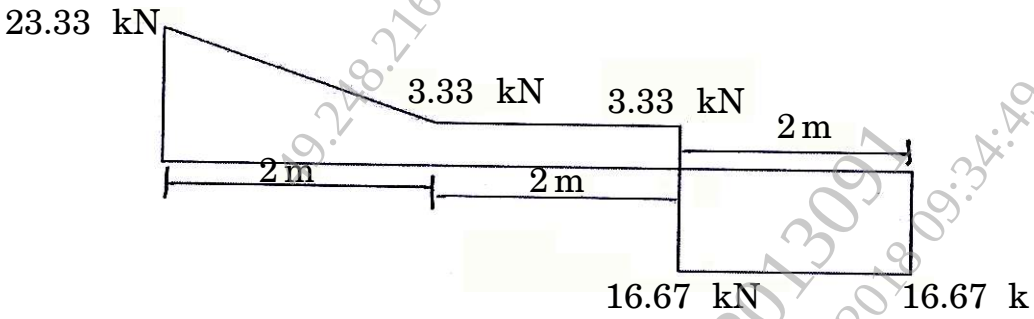

Fig. 6.2

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 × D and *b* × *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]

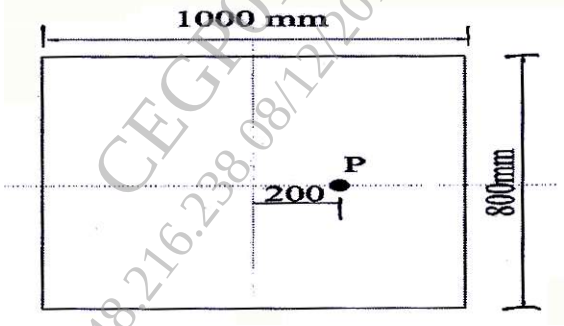

Fig. 8.1