



SE-8061

B. E. - II (Sem. - III) (Civil) Examination

May / June - 2011

Structural Analysis - I

(New Course)

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

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Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. - 2 (SEM. - 3) (CIVIL)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="STRUCTURAL ANALYSIS - 1 (NEW COURSE)"/>	<input type="text"/>
Subject Code No. : <input type="text" value="8"/> <input type="text" value="0"/> <input type="text" value="6"/> <input type="text" value="1"/>	<input type="text" value="Student's Signature"/>
Section No. (1, 2,.....) : <input type="text" value="Nil"/>	

(2) Assume suitable data if required.

(3) Figures to the **right** indicate full marks of the question.

1 (a) Derive torsion equation : 8

$$\frac{T}{J} = \frac{f_s}{R} = \frac{G \cdot \theta}{L}$$

(b) Derive Euler's formula for both ends of the column are hinged. 8

2 Attempt any two : 16

(i) A steel bar 50 mm in diameter and 2.5 m long has to transmit a shock energy of 100 N.m. Calculate instantaneous stress and elongation produced. Take  $E = 2 \times 10^5$  N/mm<sup>2</sup>.

(ii) A trapezoidal masonry dam is 9.0 m high and 2.0 m wide at top and 6.0 m at bottom. It retains water upto 8 m height on its vertical face. Find maximum and minimum resultant stress. Draw stress distribution diagram.

(iii) An 'I' section has 260 mm depth and 120 mm width. Thickness of flange and web is 10 mm. It is used as a column with one end fixed and other hinged. Using Euler's formula determine safe load.  $E = 2 \times 10^5$  N/mm<sup>2</sup>, F.O.S. = 3. Length of column is 8.0 m.

- 3 For the simply supported beam shown in figure 1. Find 18  
 (i) slope at A (ii) deflection at C (iii) maximum deflection.  
 Take  $E = 200 \text{ kN/mm}^2$ ,  $I = 6.5 \times 10^8 \text{ mm}^4$ . Use Macaulay's method.

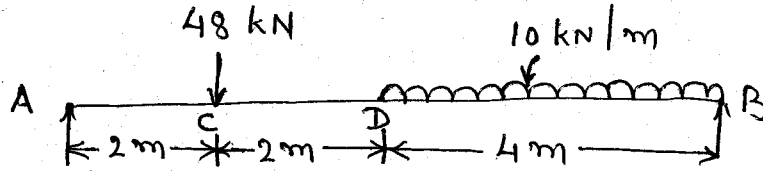


Fig.1

OR

- 3 (a) A solid circular shaft of 300 mm diameter has to 9  
 transmit 600 kW power at 200 rpm. Calculate the  
 maximum shear stress developed in the shaft material  
 and the angle of twist if the effective length of shaft  
 is 3m. Take  $C = 8 \times 10^4 \text{ MPa}$ .
- (b) A cantilever beam 120 mm wide and 150 mm deep 9  
 carries a uniformly distributed load of  $w \text{ kN/m}$  over  
 its entire span  $l$ . Find slope and deflection at free end.  
 Take  $w = \text{kN/m}$ ,  $l = 2.4 \text{ m}$   $E = 180 \text{ GPa}$  as shown in  
 figure 2.

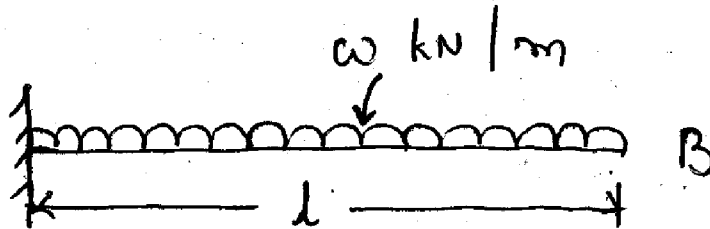


Fig.2

- 4 (a) A thin cylindrical shell of internal diameter  $d$ , 6  
 length  $l$  and thickness  $t$  is subjected to internal  
 pressure  $p$ . Prove that volumetric strain is equal to  
 twice the circumferential strain plus longitudinal strain.
- (b) Explain 'Theoretical Arch' and 'Eddy's theorem in 6  
 detail.
- (c) Explain Influence line Diagram. How ILD for BM 6  
 and normal BM are differentiated ?

- 5 (a) The systems of concentrated loads shown in Fig. 3 rolls from left to right across a simply supported beam of 40 m span, the 10 kN load leading. For a section 17 m from the left hand support. Determine the maximum BM and SF. 8

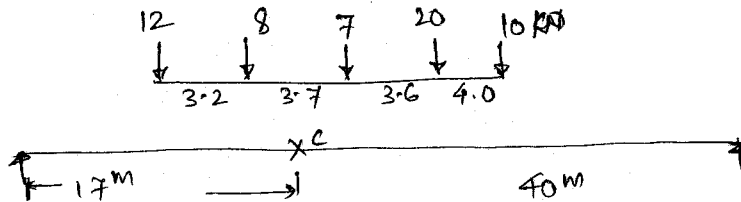


Fig.3

- (b) A cable carrying a load of 10 kN per meter run of horizontal span is stretched between supports 100 m apart. The supports are at the same level and central dip is 8m. Find greatest and least tensions in the cable. 8

OR

- 5 (a) A suspension cable is supported between two points at the same level, 75 m apart. It carries UDL of 12.5 kN/m (horizontal). Determine minimum central dip that may be allowed if the maximum tension in the cable limited to 1000 kN. 8
- (b) A three hinged parabolic arch has span 20 m and central rise 3.2 m. it carries a point load of 10 kN at 7.8 m from the left hinge. Calculate normal thrust, shear and BM at section 7.8 m from right end hinge. Also calculate maximum positive and negative bending moments and their positions. 8
- 6 (a) What are indeterminacies ? Explain in detail all types with sketches. 8
- (b) Draw bending moment diagram of rigid jointed frame as shown in Fig. 4 and show detail calculation. 8

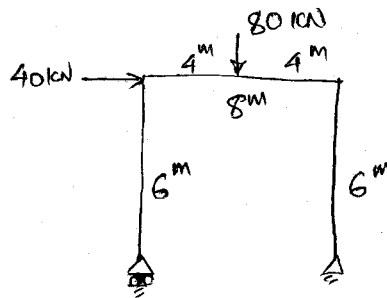


Fig.4

OR

- 6 (a) Explain in detail the following statement : 8  
"The bending moment at any section of an arch is equal to the vertical intercept between the linear arch and the centre line of the actual arch."
- (b) A thin cylinder shell of 600 mm diameter is 8  
1500 mm long and 10 mm thick, which is subjected to an internal pressure of 2 MPa. Calculate change in length, diameter and volume. Take  $1/m = 0.27$ ,  $E = 200$  GPa.
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