4E4111

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B. Tech. IV Sem. (Main/Back) Exam., June/July-2014

Civil Engineering

4CE1A Strength of Materials-II

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1._____ 2._____

UNIT-I

Q.1 (a) Derive the differential equation of the deflection curve of a beam assuming the symbols and stating accordingly with a neat diagram curve. [9]

(b) A cantilever beam AB of span L has uniform section. End B is free end and carries a point load W, while end A is fixed. Find the slope and deflection at a point C distant L/4 from the end A. [7]

OR

Q.1 (a) A beam AB of 9m Span is simply supported at the ends and is loaded as shown in Fig.1. Determine - [16]

(i) Deflection at C

(ii) Maximum deflection and

(iii) Slope at end A.

Take $E = 2\times10^5$ N/mm^2 & $I = 2\times10^7$ mm.^{4}

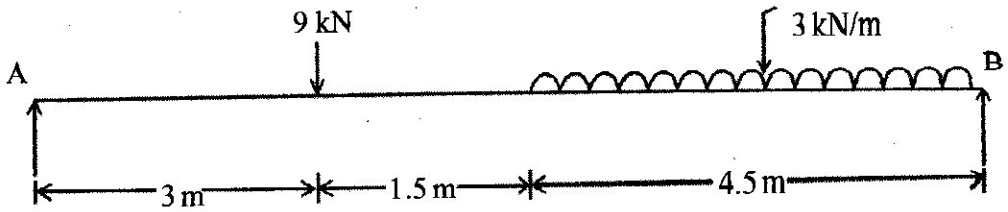

Fig.1

UNIT-II

Q.2 (a) State and derive Mohr's theorems for area moment equations assuming & stating symbols used. [8]

(b) Determine the angle of rotation and deflection at free end of a cantilever beam AB with a uniform load w acting over middle third of the length as in Fig 2. [8]

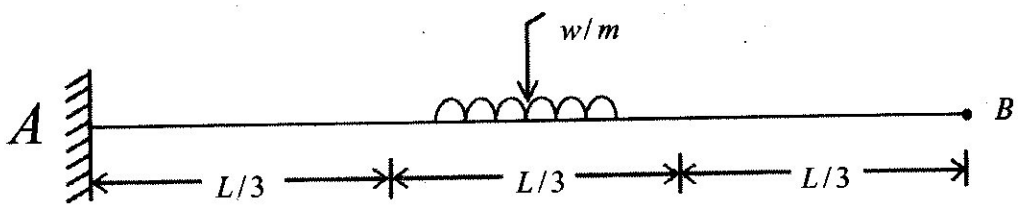

Fig.2

OR

Q.2 (a) A cantilever AB is fixed at end A and rigidly propped at end B. Find [8]

(i) The prop reaction, and

(ii) The slope at the propped end by conjugate beam method.

The beam UDL of w over its entire span

(b) A simply supported beam carries a UDL of 50 kN/m over a spam of 2m, along with an axial compression force 50 kN. The beam section is rectangular with width 120 mm and depth 240 mm. Compute - [8]

(i) Maximum fibre stress

(ii) Fibre stress at a point o.5 m from the left end and 80 mm below N.A.

UNIT-III

Q.3 What do you understand by a fixed beam? A fixed beam of span L carries a UDL 'w' over entire span. The second moment of area of the beam section is not same throughout, for a length L/4 from each end its value is 2I and for a middle length L/2, it is I. Determine the B.M. at ends and sketch the SFD and BMD for the beam stating principal values. [16]

OR

Q.3 Using Clapeyron's theorem of three moments, analyse a continuous beam shown in Fig.3. Also plot BMD and SFD indicating principal values, the supports of the beam being at same level. [16]

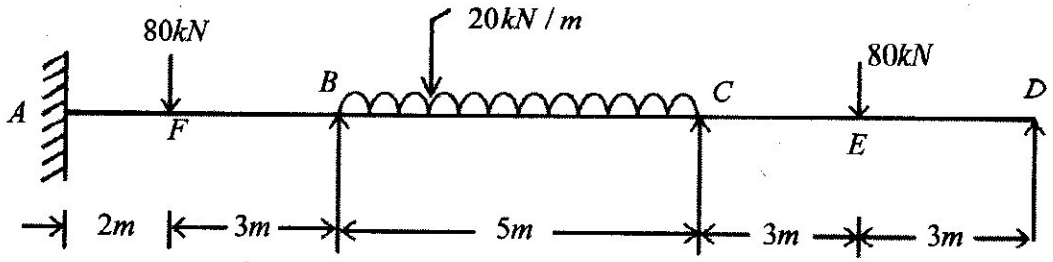

Fig.3

UNIT-IV

Q.4 (a) Derive the following relation for intensity of shear stress at any point in the cross- section of a shaft subjected to pure torsion stating the assumptions made.

$\frac{fs}{R} = \frac{q}{r} = \frac{N\theta}{L}$ where symbols have got their usual meaning. [10]

(b) Find the maximum torque that can be safely applied to a shaft of 200 mm dia, if permissible angle of twist is 1° in a length of 5m and the permissible shear stress is 45N/mm2. Take modulus of rigidity (N) = 0.8×10^5 N/mm^2. [6]

OR

Q.4 (a) An open coiled helical spring made of 4mm dia steel wire, has 8 coils of 40 mm diameter and 30 mm pitch. The spring is subjected to a winding torque about the axis of the spring, resulting in an increase in the number of coils by 0.8, the length remaining the same (i.e. 240 mm), Determine -

(i) The torque required

(ii) Minimum elastic limit strength of steel to permit this amount of winding.

Take $E = 2\times10^5$N/mm2 and $N = 0.83 \times 10^5$N/mm^2 [8]

(b) Design a laminated steel spring, simply supported at the ends and centrally loaded with a span of 800 mm, given the following:

(i) Proof load = 8.5 kN, $E = 2\times10^5$N/mm^2

(ii) Maximum central deflection = 50mm

(iii) Ratio of width to thickness = 10

(iv) Permissible bending stress = 370 N/mm2

The plates are available in the multiple of 1 mm for thickness and in the multiple of 3 mm for width. [8]

UNIT-V

Q.5 Write Short notes on the following: [4×4=16]

(a) Critically damped system

(b) Logarithmic Curve

(c) D' Alembert's principle and its Utility

(d) Resonance and Natural Time Period of Oscillations

OR

Q.5 Define and derive the solution of differential equation of motion. Also define the differential equation of mass. [16]

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