Question Paper

Exam Date & Time: 27-Apr-2018 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
SECOND B.Sc (APPLIED SCIENCES)
END-SEMESTER THEORY EXAMINATIONS APRIL - 2018
DATE : 27 APRIL 2018
TIME : 9:30AM TO 12:30PM

Mechanics Of Structures [ICE 122]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

Assume missing data, if any, suitably and indicate them clearly.

1) Determine the forces in the members of the roof truss shown in Fig. 01. (20)

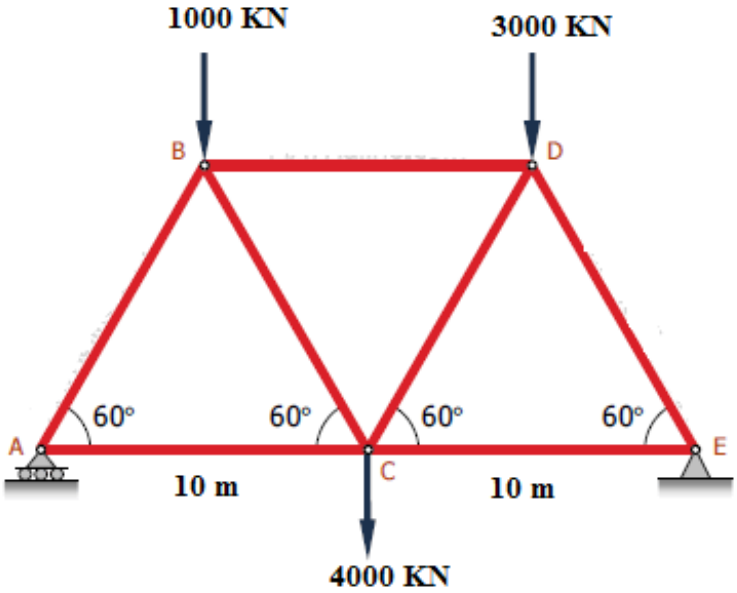

Fig. 01

2) Draw the SFD and BMD for the beam shown the Fig. 02. Also calculate the maximum bending moment. (20)

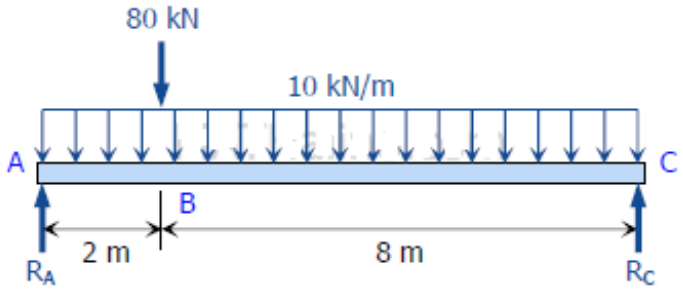

Fig. 02

3) List the assumptions made in simple theory of bending. (5)

A)

B) Find the section modulus for a hollow rectangular section. (5)

C) A simply supported beam of span 5m has a cross section of 150mm x 250mm, if the permissible stress is 10 N/mm^2 , find (10)
a) Maximum intensity of UDL it can carry.
b) Maximum concentrated load P applied at 2m from one end it can carry.

4) Derive torsion equation. (10)

A)

B) A 2.5 m long pin ended column of circular section is to be made of timber.Determine the size of column to support a load of 150 KN. (10)
Given: E = 10 GPa, Allowable stress = 10 N/mm^2, Factor of safety =3

5) A cable of uniform sections is suspended between two supports 100m apart. It carries a UDL of 10KN/m spread over the horizontal span. The lowest point of cable sags 10m below the supports. Find i) Maximum and minimum tension in the cable and its inclinationii) Minimum required cross-section area of cable if the allowable stress is 280MPa and the length of the cable. (20)

6) Explain Castigliano's First Theorem of strain energy. (10)

A)

B) Determine the maximum slope and maximum deflection in a cantilever beam of span 'L' subjected to a point load 'W' at its free end by strain energy method. (10)

7) Define the following terms: (5)
a) Shear Force
b) Bending moment
c) Sagging moment

A)

d) Hogging moment
e) Point of Contraflexure

B) Show that the hollow circular shaft is stronger and stiffer than a solid circular shaft of the same material, weight and length. (15)

8) A) a) The state of stress at a point in a strained material is shown in Fig. 03(i) Locate the principal planes and find the principal stresses, (10)
(ii) Locate the Max. shear stress planes and find the max. shear stress.

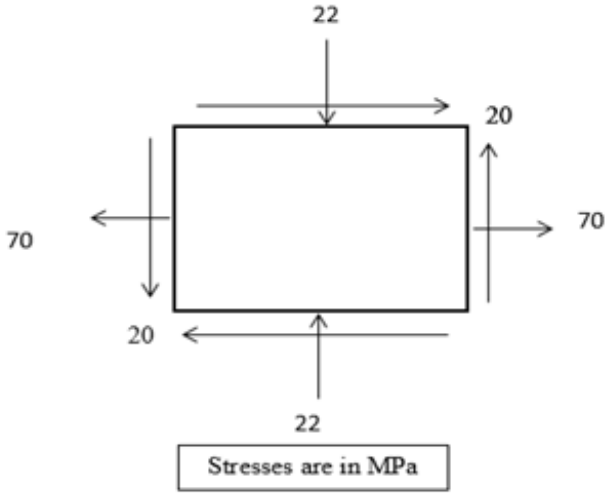

Fig. 03

B) Using strain energy method, determine the vertical displacement at the free end of the cantilever beam shown in the Fig. 04. Given E = 200 KN/ mm^2 and I = 20 x 10^6 mm^4 . (10)

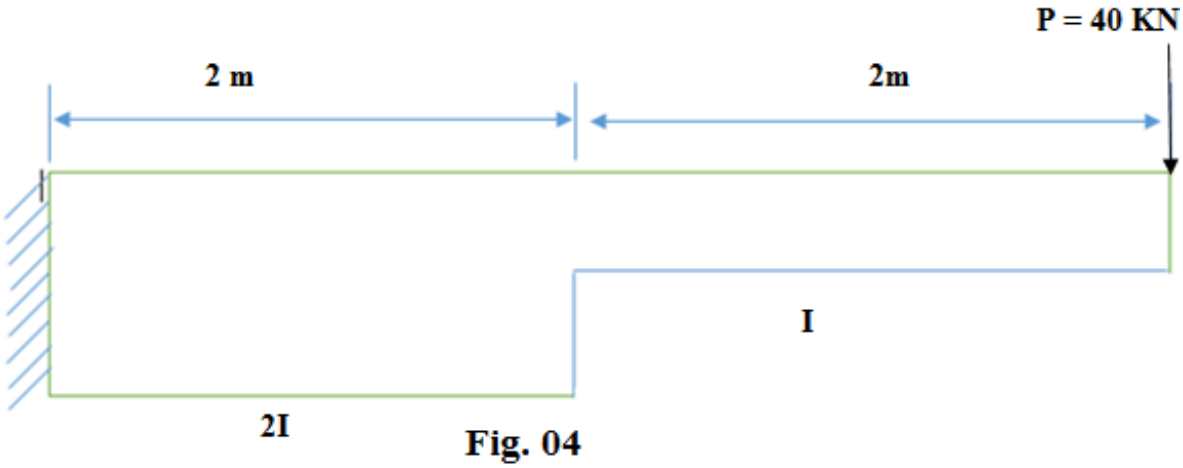

Fig. 04

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