# **Question Paper**

Exam Date & Time: 25-Apr-2018 (09:30 AM - 12:30 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

#### INTERNATIONAL CENTRE FOR APPLIED SCIENCES II SEMESTER B. S (ENGG) END-SEMESTER THEORY EXAMINATION- APRIL 2018 DATE:25.04.2018 TIME:09.30AM TO 12.30PM Strength Of Materials [ME 124]

Marks: 100

Duration: 180 mins.

### Answer 5 out of 8 questions.

## Missing data, if any, may be suitably assumed

- <sup>1)</sup> Write the difference between the features of stress- strain <sup>(10)</sup> <sub>A)</sub> curves of ductile and brittle materials with graph.
  - <sup>B)</sup> Drive an expression for deformation in a simple bar under <sup>(10)</sup> axial load
- Obtain the equations for shear force and bending moment (10)
  for a cantilever beam subjected uniformly distributed load.
  - Also draw the shear force and bending moment diagrams
  - B) A simply supported beam of 5 meters long. It carries a load <sup>(10)</sup> of 10 KN at a point C which is 2 meters from the right support B and 20 KN at a point D which is 2 meters from the left support A. Determine the shear force and bending moment at the salient points and also draw the shear force and bending moment diagrams.
- <sup>3)</sup> Derive the expression for shear force and bending moment <sup>(10)</sup> for a simply supported beam subjected to a point load and
  - also draw the shear force and bending moment diagrams.
  - B) A cantilever beam of 5 meters long, carries a load of 10 KN <sup>(10)</sup> at its free end and a load of 20 KN at a point C which is 2 meters from the fixed end. Determine the shear force and bending moment at the salient points. Also draw the shear force and bending moment diagrams.
- <sup>4)</sup> Derive the equation for bending for a beam. <sup>(10)</sup>
  - A)
  - <sup>B)</sup> A cast iron cantilever beam of length 1.5 meters, fails when <sup>(10)</sup>

a load of 1920 N is applied a its free end. Determine the stress at failure if the cross-section of the beam is 40 mm x 40 mm.

- <sup>5)</sup> Determine the equation for the slope and deflection for a <sup>(10)</sup> cantilever beam subjected to a moment at its free end.
  - <sup>B)</sup> Determine the differential equation for deflection in a <sup>(10)</sup> beam.
- <sup>6)</sup> A symmetrical I section with top and bottom flange are 200  $^{(10)}$ <sup>A)</sup> mm x 10 mm and web is 380 mm x 8 mm. The shear force acting on the I section is 100 KN. Determine the shea stress at bottom of the top flange.
  - <sup>B)</sup> Determine the equation for slope and deflection for a (10) simply supported beam subjected to a point load at its centre.
- Find the slope and deflection for a for a cantilever beam of <sup>(10)</sup>
  3 meter long subjected to a point load of 10 KN at its free
  - end. Take  $E = 2x10^5$  N/ mm<sup>2</sup> and  $I=2x10^8$  mm<sup>4</sup>.
  - <sup>B)</sup> State the assumptions of Euler's column theory. <sup>(6)</sup>
  - <sup>C)</sup> Write the differences between the long column and the <sup>(4)</sup> short column.
- Show that the hallow circular shaft whose inner diameter is <sup>(10)</sup>
  half the outer diameter has a shear strength equal to16/15
  A)
  - times of that of a solid shaft of the same outer diameter.
    A pipe of 60 mm internal diameter and 100 mm external <sup>(10)</sup>
  - diameter carries a fluid at a pressure of 20 N/mm<sup>2</sup>. Find the maximum hoop stress in the section of the pipe by using Lame's equation.

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