Reg.No.									

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

II SEMESTER B.S. DEGREE EXAMINATION – APRIL / MAY 2017

SUBJECT: STRENGTH OF MATERIALS (SUBJECT CODE: ME124)

(BRANCH: ME / MET/AVI /AUTO/ IP)

Friday, 28 April 2017

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1A. Write a note on:

i) Strain energy

ii) Young's modulus

iii) Modulus of rigidity

iv) Tensile stress

v) Factor of safety

1B. Briefly discuss the salient features of stress-strain curve for mild steel.

(10+10)

2A. Derive an expression for shear force and bending moment for a cantilever beam subjected to a point load at its free end. Also draw the shear force and bending moment diagrams.

2B. A cantilever beam of 5 meters long, carries a load of 20 KN at its free end and 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. **(10+10)**

3A. Derive an expression for shear force and bending moment for a simply supported beam subjected to uniformly distributed load. Also draw the shear force and bending moment diagrams.

3B. State the simple bending theory and discuss the effect of sagging and hogging moments on a beam.

3C. State any 4 assumptions of simple bending theory. **(10+6+4)**

4A. Derive the bending equation for a beam.

4B. A cantilever beam of length 1.5 meters, fails when a load of 1920N is applied at its free end. Determine the stress at failure if the cross-section of the beam is 40mm x 60mm. **(10+10)**

5A. Derive an expression for shear stress in a beam.

5B. Find the shear stress at the bottom of the flange of a T section with flange 100 mm x 12 mm and web is 88 mm x 12 mm. The shear stress acting on the T section is 20 KN. **(10+10)**

6A. Derive an expression for differential equation for deflection in a beam.

6B. Determine the equation for slope and deflection for a cantilever beam subjected to a point load at its free end. **(10+10)**

7A. A simply supported beam of 14 meters long. It carries a load of 90 KN at a point C which is 3 meters from the left end and a load of 60 KN at a point D which is 4.5 meters from the right end. Determine the deflection at the point C and D under two loads using Macaulay's method. Take $E= 210x10^6$ KN/m^2 and $I = 64x10^{-4}$ m^4.

7B. A hollow mild steel tube of 6 meters long, 4 cm internal diameter and 5 cm external diameter is used as a strut with both ends are hinged. Determine the crippling load and safe load taking factor of safety as 3 and $E=2x10^5$ N/mm^2. **(10+10)**

8A. What is the diameter of a solid steel shaft that will not twist through more than 3 degree in a length of 6 meters when subjected to a torque of $12x10^6$ N-mm. Take $G = 83x10^3$N/mm^2.

8B. A pipe of 400 mm internal diameter and 100 mm thickness contains a fluid at a pressure of 80N/mm^2. Find the minimum hoop stress in the section of the pipe using Lame's equation. **(10+10)**