Question Paper

Exam Date & Time: 04-Jun-2018 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
II SEMESTER B.Sc. (Applied Sciences) DEGREE MAKE UP- EXAMINATION - MAY / JUNE 2018
DATE: 4 JUNE 2018
TIME : 9.30 AM TO 12.30 PM
Strength Of Materials [IME 123]

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

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

1) A) Discuss the following: (10)
   a) Thermal stress
   b) Modulus of rigidity
   c) Young's modulus
   d) Factor of safety
   e) Hook's Law

   B) A steel rod of length 20 m at a temperature of 20Â°C. Find the free expansion of the rod when the temperature is raised to 65Â°C. Also find the temperature stress and strain when the free expansion of the rod is prevented. Take E = $2x10^5$ N/mm^2 and coefficient of thermal expansion = 0.000012/ Â°C. (10)

2) A) Derive the equation for shear force and bending moment for a cantilever beam subjected to a concentrated load. Also draw the shear force and bending moment diagram. (10)

   B) Draw the shear force and bending moment diagram for a simply supported beam of length 5 m subjected with a load of 20 KN at a distance of 2 m from end A and a load of 10 KN is acting at distance of 2 m from the end B. (10)

3) A) A cantilever beam of 6 m long carries a load of 20 KN at its free end and 20 KN at a distance of 3 m from the fixed end. Determine the shear force and bending moment at the salient points and also draw the shear force and bending moment diagram. (10)

	B)	Derive an expression for shear force and bending moment for simply supported beam subjected to UDL and also draw shear force and bending moment diagram	(10)
4)		Discuss how the simple bending theory is derived.	(2)
	A)		
	B)	Derive an equation for moment carrying capacity of a section of a beam.	(8)
	C)	A beam is of T section with flange 100 mm x 12 mm and web is 12 mm x88 mm.Find the shear stress at the neutral axis if the shear force acting on the beam is 20000N.	(10)
5)		Derive the equation for shear stress developed in a beam.	(10)
	A)		
	B)	Find the stress at failure for a cantilever beam of length 2 m, fails when a load of 12 KN applied at its free end. The cross- section of the beam is 200 mm x 200 mm.	(10)
6)		Determine the equation for slope and deflection for a cantilever beam subjected to UDL.	(10)
	A)		
	B)	Prove that $\mathbf{EI(d^2y/dx^2) = M}$	(10)
7)		Find the slope and deflection for a cantilever beam of 3 m long subjected to a point load of 10 KN at its free end.Take EI = $4x10^4$ KN-m^2.	(10)
	A)		
	B)	Find the angle of twist for a solid shaft of length 6 m and diameter is 114 mm when subjected to a Torque of 12 $x10^6$ N-mm. Take G = $83x10^3$ N/mm^2.	(10)
8)		Derive an expression for Rankin's load using Rankin formula.	(10)
	A)		
	B)	The internal diameter of the pipe is 60 mm and thickness 20 mm, carries a fluid at a pressure of 20 N/mm^2. Find the maximum hoop stress by using Lame's equation.	(10)

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