Code No: RT21032 **R13** SET - 1

II B. Tech I Semester Supplementary Examinations, Oct/Nov- 2017
MECHANICS OF SOLIDS
(Com. to ME, AME, AE, MTE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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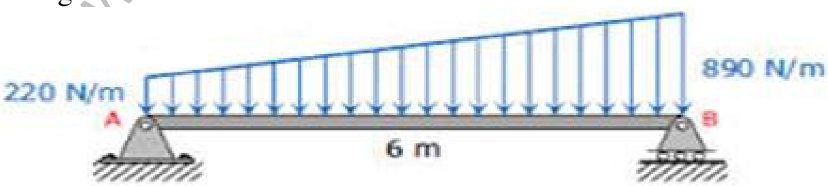
PART –A

1. a) Define simple and cantilever beams with help of diagrams (2M)
b) Define strength and ductility (2M)
c) Derive the relation between load, shear force and bending moment (5M)
d) Define point of contra flexure (2M)
e) A cantilever beam of length 4m is subjected to point load of magnitude 20KN at free end. Calculate slope and deflection at free end of cantilever. Take E=210GPa, I=9500 cm^4 (5M)
f) Differentiate between thin and thick cylinders (4M)
g) Define buckling (2M)

PART –B

2. a) Derive the relation between Young's modulus, shear modulus and bulk modulus. (7M)
b) Draw the Mohr's circle for the following state of stress. (9M)
$\sigma_x = 40MPa, \quad \sigma_y = -15MPa, \text{ and } \tau_{xy} = 20MPa$
Calculate i) Principal stresses ii) Maximum shear stress iii) Planes on which principal stresses are acting iv) Planes on which shear stress is acting v) Calculate normal and shear stress on an oblique plane of 35^0

3. Draw the Shear force and bending moment diagram for the loaded beam as shown in figure. (16M)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4. a) Derive the flexure formula (8M)
   b) The tension flange of a girder of I section is 240mmX40mm, where as the compression flange is 120mmX20mm. The web is 300mm deep and 20mm thick. If the girder is used as a simply supported beam of span 8m, determine the load per meter run if the allowable stress is 90MPa in compression and 30MPa in tension. (8M)

5. a) State Mohr's theorems (4M)
   b) A simply supported beam of span 20m carries two concentrated loads 4KN at 8m and 10KN at 12m from the left side support. Using Macaulay's method (12M)
   i) Calculate deflection under each load ii) Calculate maximum deflection
   iii) Calculate slope at both supports.

6. A compound cylinder is made by shrinking a cylinder of external diameter 300mm and internal diameter of 250mm over another cylinder of external diameter 250mm and internal diameter 200mm. The radial pressure at the junction after shrinking is 8 N/mm^2. Find the final stresses set up across the section, when the compound cylinder is subjected to an internal fluid pressure of 84.5 N/mm^2 (16M)

7. a) Derive torsion formula (8M)
   b) Derive an expression for critical buckling load for the case of Hinged-Hinged Column. (8M)