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

II B. Tech I Semester Supplementary Examinations, May/June - 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) Write all the relations relating the elastic constants? (4M)
   b) Explain about the concept of Bending moment? (3M)
   c) Define Section modulus and moment of resistance? (4M)
   d) Explain about Mohr's theorem? (4M)
   e) Explain about Riveted boiler shells? (3M)
   f) Write about Buckling and Stability of Columns? (4M)

PART -B

2. a) The following data refer to a tensile test conducted on a mild steel bar : (10M)

   diameter of the specimen = 20 mm

   length of the specimen = 200 mm

   extension at a load of 40 kN = 0.12mm

   Load at yield point = 80kN

   Maximum load = 150 kN

   Total extension = 50 mm

   Neck diameter = 15 mm.

   Determine (i) young's modulus (ii) yield stress (iii) ultimate stress (iv) percentage elongation and (v) percentage reduction in area.

   b) A Compound bar 1 metre long is 40 mm diameter for 300 mm length, 30 mm diameter for the next 350 mm length. Determine the diameter of the remaining length so that its elongation under an axial load of 100 KN does not exceed 1mm. Take E = $2X10^5$ N/mm^2. (6M)

3. A beam of span 12m is simply supported at two points 8M apart with equal overhang on either. The beam carries a uniformly distributed load of 2.5 kN/m run over the entire span. Construct the SFD and BMD. Locate also the points of contra flexure. (16M)
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4. a) From first principles show that the maximum shear stress in a beam of circular section is 4/3 times the average shear stress. (6M)
   b) A beam is of T-section, flanges 135mm x 12mm and web 120mm x 15mm. It is subjected to a sheer force of 29kN. Draw shear stress distribution across the depth marking values at salient points. What percentage of the shearing force at any section is carried by the web? (10M)

5. a) Derive the relationship between slope, deflection and radius of Curvature of a simply supported beam. (8M)
   b) A 300 mm long cantilever of rectangular section 48 mm wide and 36 mm deep carries a uniformly distributed load. Calculate the value of load *w* if the maximum deflection in the cantilever is not to exceed 1.5 mm. Take $E = 70X10^9$ GN/m^2. (8M)

6. a) Show that in the case of a thin cylindrical shell subjected to an internal fluid pressure, the tendency to burst length wise is twice as great as a transverse section. (8M)
   b) A vertical cylindrical gasoline storage tank made of 20mm thick mild steel plate has to withstand maximum pressure of 1.5 MN/m^2. Calculate the diameter of the tank if stress 240 MN/ m^2, factor of Safety 2 and joint efficiency 70%. (8M)

7. A hollow shaft of internal diameter 3/8th of external diameter is required to transmit 600 KW at 200 rpm, the maximum torque being 20% greater than the mean. If the maximum shear stress is to be limited to 65 N/mm^2 and the twist in a length of 4M is not to exceed 2^o, determine the external diameter of the shaft. Take G = 0.8 x 10^5 N/mm^2. (16M)