INDIAN MARITIME UNIVERSITY
(A Central University, Govt.of India)

May/June 2015 End Semester Examinations

SEMESTER – II, B.TECH (MARINE ENGINEERING)

STRENGTH OF MATERIALS - I (T 2204 / T 1204)

Date:15.06.2015 **Max.Marks:100**
Time:-3 Hrs **Pass Marks:50**

Note : 1. Section "A" Compulsory carry (10 X 3) = 30 marks.
2. Section "B" answer any **FIVE** questions out of seven questions.
All question carry equal marks (14 X 5 = 70 marks.)

PART – A **(3 x10 = 30 Marks)**
(Compulsory Questions)

1. a) State Hook's law for elastic materials. **(3)**

   b) Show the symbol for Roller support and the its expected reaction due to load applied on the beam where it supports the beam **(3)**

   c) List all type of loads which are applicable and sketch one type of load with a simply supported beam. **(3)**

   d) Define Torsional section modulus and work out torsional section modulus for a solid circular shaft having a diameter "D" mm. **(3)**

   e) Define Poisson's ratio (μ) and state its value for metals. **(3)**

   f) Define proof resilience. **(3)**

   g) Give relation between modulus of Elasticity & modulus of rigidity. **(3)**

   h) Explain the term hydrostatic state of stress. Give formula or relation between volumetric strain & linear stain. **(3)**

   i) Define stress and mention the type of stresses. **(3)**

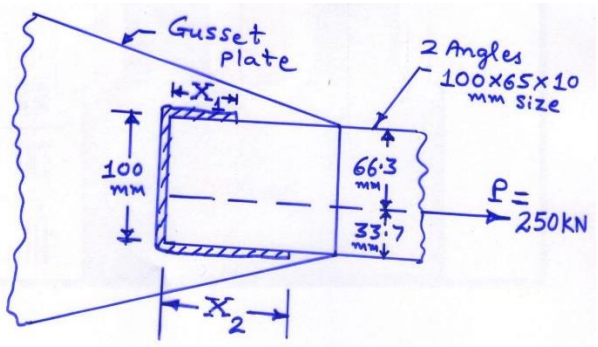
   j) Define Torsional Fleseibility and Torsional Rigidity. **(3)**

PART – B **(5 x14 = 70 Marks)**
(Answer any five of the following)

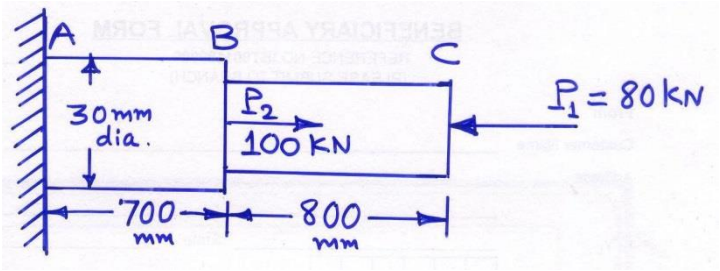
2. a) Draw stress-strain curve for mild-steel structural material and specify the important points on the curve **(7)**

   b) Find power transmitted by a shaft having 60 mm diameter rotating at 150 R.P.M. if maximum permissible shear stress is 80 MPa. **(7)**

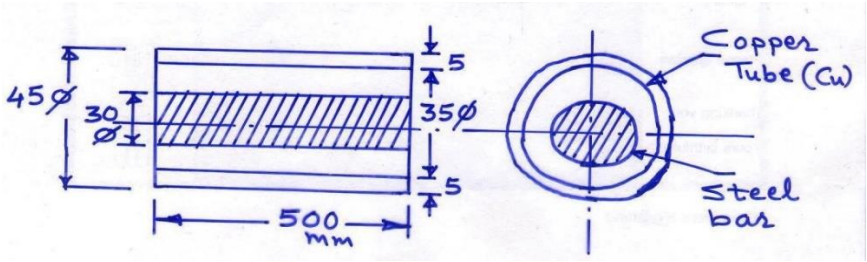
3. A tie-bar in a truss consisting of a double angle section 100 X 65mm X 10 mm thickness. It carries a tensile load of 250 KN is to be welded to a gusset plate as shown in figure. Design the joint with 8 mm fillet welds allowing a shear stress of 102.5 N/mm^2 in the weld. **(14)**



4. For a member ABC as shown in figure find diameter of the portion BC, if the total deformation of the member is 3 mm. Diameter of AB portion is 30 mm use modulus of electricity E = 200 Gpa **(14)**



5. A steel bar is enclosed in a copper tube and ends are welded together. The combined structure is heated and increase in temperature observed is 30^{0}C calculate actual expansion of the composite bar. The temp. co-efficient for steel & copper are α s = 12 X 10^{-6}/^{0}C and α cu = 16 X 10^{-6}/^{0}C respectively. Modulus of Elasticity E-steel = 200 GPa and E-copper = 100 GPa. Copper tube is 45 mm outside diameter & thickness of tube is 5 mm, Length 500 mm. Steel bar diameter is 30 mm & Length 500 mm. **(14)**

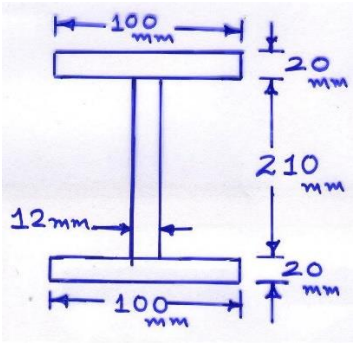


6. A hollow circular shaft has external diameter 100 mm and Internal diameter 80 mm. Find the safe power that can be transmitted if allowable shear stress is 100 MPa and maximum angle of twist is 3^0 for 2 meter length. Take speed of shaft as 2.5 RPS and maximum torque to exceed by mean torque by 20% take G=80 GPa. **(14)**

7. a) Draw stress-strain curve for mild-steel structural material and specify the important points on the curve. **(7)**

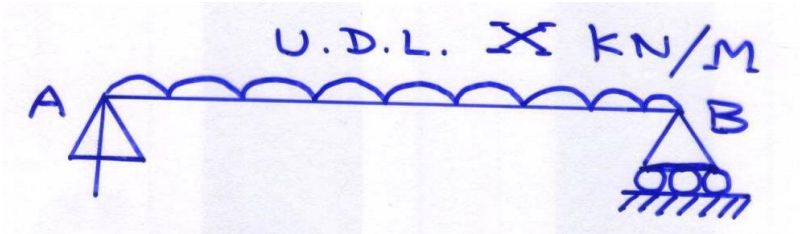
   b) Find power transmitted by a shaft having 60 mm diameter rotating at 150 R.P.M. if maximum permissible shear stress is 80 MPa. **(7)**

8. Find moment of resistance of the beam section 100 X 250 mm, having both flange thickness are 20 mm and web' thickness is 12 mm; for the given conditions. **(14)**



   i) Permissible stress in bending σb = 100 Mpa
   ii) Permissible stress in bending compression and tension is 80 Mpa and 100 MPa respectively.

9. Draw a S.F.D. (sheer force diagram) and B.M.D. (bending moment diagram) for the given simply supported beam shown below and is loaded with U.D.L. of "X" KN/meter.



10. A boiler shell is to be made of 15 mm thick plate having tensile stress of 120 MN/m^2. If the efficiencies of the longitudinal and circumferential joints are 40% and 30% respectively. Determine : **(14)**

    i) Maximum permissible diameter of the shell for an internal pressure of 2MN / m^2.
    ii) Permissible intensity of internal pressure when the shell diameter is 1.5 m.

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