Printed Pages : 7

ME-304

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 140307

Roll No.

B.Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

STRENGTH OF MATERIALS & MACHINE DRAWING-I

Time : 3 Hours] [Total Marks : 100

Note : (1) This question paper consists of **3** sections. Section–A carries **20** marks, Section–B carries **30** marks and Section–C carries **50** marks.

(2) Attempt **all** questions. Marks are indicated against each question.

(3) Assume missing data suitably if any.

(4) Notations used have usual meanings.

SECTION - A

1 Answer **all** the following parts : **(10×2 =20)**

(a) If the ratio G/K = 0.3, then what is the value of Poisson's ratio? Where E is the Modulus of Elasticity? G is the Modulus of Rigidity and K is bulk Modulus.

(b) Permissible bending moment in circular shaft under pure bending is M, according to the Maximum Principal Stress Theory. What will be the value of Permissible bending moment in the same shaft, according to the Maximum Shear Stress Theory ?

(c) For a General two dimensional stress system, what are the coordinates of the centre of Mohr's circle?

(d) What do you mean by pure bending of a beam ?

(e) Define Slenderness Ratio of a column.

(f) What do you mean by Torsion of a shaft ?

(g) Sketch the convention of round section.

(h) Name four head forms of rivets.

(i) Draw the free hand sketch of a hexagonal bolt.

(j) What is difference between pitch and lead ? Give an example.

SECTION - B

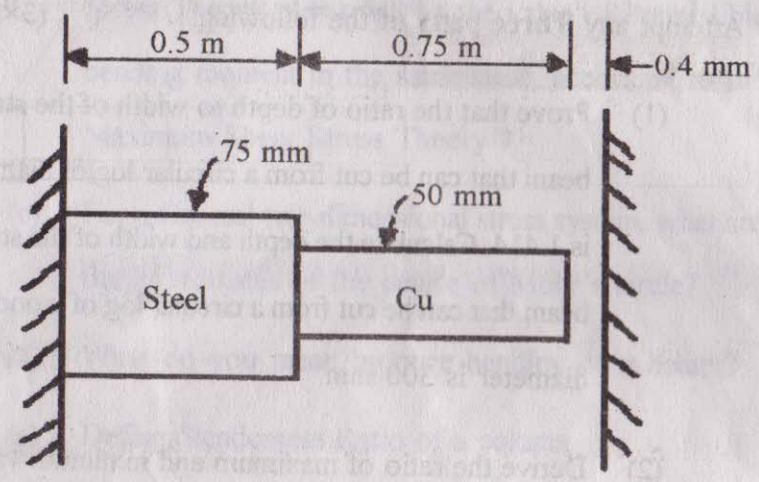
Attempt any **Three** parts of the following : **(3×10=30)**

(1) Prove that the ratio of depth to width of the strongest beam that can be cut from a circular log of diameter'd' is 1.414. Calculate the depth and width of the strongest beam that can be cut from a circular log of wood whose diameter is 300 mm.

(2) Derive the ratio of maximum and minimum values of stresses for a curved bar of rectangular section in pure bending. Radius of curvature is 8 cm and depth of beam is 6 cm. Locate the Neutral Axis.

(3) A rod consists of two parts that are made of steel and copper as shown in figure below. The elastic modulus and coefficient of thermal expansion for steel are 200 GPa and 11.7×10^{-6} per °C respectively and for copper 70 GPa and 21.6×10^{-6} per °C respectively. If the temperature of the rod is raised by 50°C,

determine the forces and stresses acting on the steel rod and copper rod.



(4) Draw the Mohr's circle for a 2-dimensional stress field subjected to :

(a) Pure Shear

(b) Pure bi-axial tension

(c) Pure uni-axial tension

(d) Pure uni axial compression.

(5) A flat bar of section 50 mm × 10 mm is subjected to an axial pull of 130 kN. One side of the bar is polished and lines are ruled on it to form a square of

30 mm side, one diagonal of the square being along the middle line of the polished side. If E = 200 GPa and Poisson's ratio is 0.25 .Calculate the change in the angles and sides of the square.

SECTION - C

Attempt **all** questions : **(5×10=50)**

1. A thin cylinder with closed ends has an internal diameter of 50 mm and a wall thickness of 2.5 mm. It is subjected to an axial pull of 10 kN and a torque of 500 Nm while under an internal pressure of $6MN/m^2$.

   (I) Determine the principal stresses in the tube and the maximum shear stress.

   (II) Represent the stress configuration on a square element taken in the load direction with direction and the magnitude indicated (schematic).

2. Derive "Winkler –Bach formula" for bending of bars having initial curvature.

3. A closed coil helical spring of circular cross section having a mean diameter of 60 mm is subjected to an axial load of 80 kN applied at the end of spring producing a shear stress of 100 N/mm^2 and a deflection of 50 mm. Find the diameter, the number of coils, the length of the spring wire, and strain energy stored in the spring. Take G = 80 kN/mm^2.

OR

In an experimental determination of the buckling load for 1.2 cm diameter mild steel pin ended struts of various lengths, two of the values obtained were:

(I) When Length = 50 cm and load = 10 kN and

(II) When Length = 20 cm and load = 30 kN and

Make the necessary calculations, and then state whether either of the above values of loads conforms with the Euler's formula for the critical load. Take E= 200 GPa.

4. Draw the top view and sectional front view of single riveted butt-joint with double cover plates. The thickness of the plate is 9mm. Show at least three rivets. Indicate all the dimensions. Use snap headed rivets and show all calculation on the answer sheet.

5. A cylinder 60mm diameter and 80mm long stands with its circular base on HP. A section plane perpendicular to VP and inclined at 60 degree to HP cuts the axis at a point 28mm below its top end. Draw sectional top and right views and true shape of the section.

OR

Draw the following views of a SOCKET and SPIGOT COTTER JOINT used for Joining two rods of diameter 20mm :

(I) Sectional front view

(II) A view looking from socket end.
