

Total No. of Pages : 02

**Total No. of Questions : 09**

**B.Tech.(Marine Engineering) (2013 Batch)/(ME) (2011 Onwards)**  
**(Sem.-3)**

## STRENGTH OF MATERIALS-I

**Subject Code : BTME-301**

**Paper ID : [A1138]**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTION TO CANDIDATES :**

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION-B contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.

## SECTION-A

1. **Write briefly :**
  - a) What is the effect of couple on SFD and BMD of any beam?
  - b) How will you apply principle of superposition in a stepped bar ?
  - c) State the assumptions made in theory of simple bending.
  - d) How is moment area method used in finding slope and deflection of beams?
  - e) Define principal planes and principal stresses.
  - f) Define thermal stress and thermal strain.
  - g) Explain the effect of change in temperature for a composite bar.
  - h) Distinguish between centre of gravity and centroid.
  - i) What is meant by point of contraflexure in bending of beams?
  - j) Discuss the failure for long and short columns.

## SECTION-B

2. Derive the relation between bulk modulus and Young's modulus in terms of Poisson's ratio.
3. Three beams have same lengths, allowable stresses and bending moments. Cross sections of the beams are shown in Fig. 1. Find the ratios of weights of circular and rectangular cross section beams with respect to the square cross section beam.

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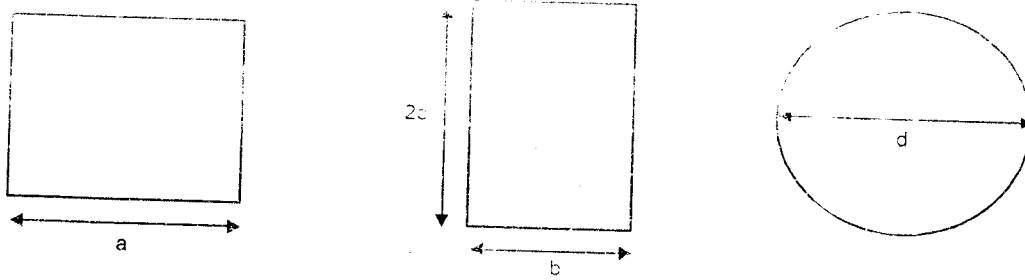


Fig-1

4. The internal diameter of a steel shaft is 75% of the external diameter. The shaft is to transmit 3000 kW at 200 rpm. If the maximum allowable shear stress in the shaft material is 50 MPa. Calculate the diameter of the shaft. Find also the twist of the shaft when it is stressed to the maximum permissible value. The length of the shaft is 4m. Take  $C = 800 \text{ MPa}$ .
5. Derive effective length results for columns with both ends pin jointed and the other column having one end fixed, other pin jointed.
6. A cantilever of length ' $2a$ ' is carrying ' $W$ ' load at free end and ' $W$ ' load at the centre. Using Moment Area Method, determine the slope and deflection at the free end.

### SECTION-C

7. A reinforced concrete circular column of 400mm diameter had 4 steel bars of 20mm diameter embedded in it. Find the maximum load which the column can carry, if the stresses in steel and concrete are not to exceed 120MPa and 5MPa respectively. Elastic modulus of steel = 18 times elastic modulus of concrete.
8. Derive the expressions for effect of eccentric loading on the Rankine and Euler formulae for long columns.
9. Draw SFD and BMD. Locate the point of contra flexure for Fig-2.

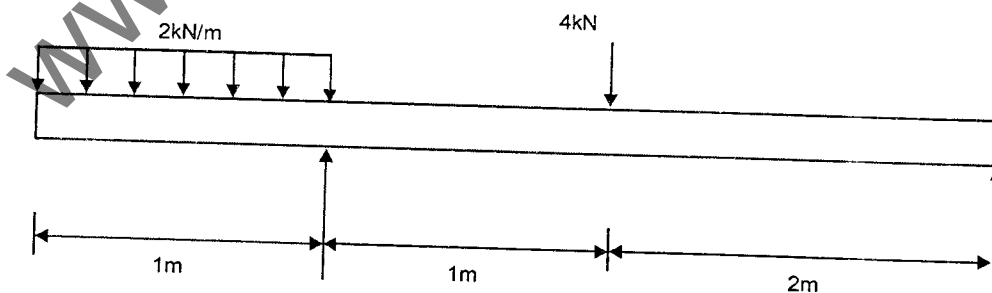


Fig-2