

Figure-3

**Section – C**

- Q-5. A steel cube block of 55 mm side is subjected to a force of 6 kN (tension) 8 kN (compression) and 4 kN (tension) along x, y and z directions respectively. Determine the change in the volume of the block. Take  $E = 200 \text{ kN/mm}^2$  and Poisson ratio is  $\frac{3}{10}$ . [20]
- Q-6. A solid shaft of 20 cm diameter has the same cross sectional area as the hollow shaft of same material with inside diameter of 15 cm.
- Find the ratio of horse powers transmitted by the two shafts at the same angular velocity.
  - Compare the angles of twist in equal length of these shafts, when stressed to the same intensity. [2x10=20]
- Q-7. Draw shear force and bending moment diagram for cantilever beam shown in Figure-4. [20]

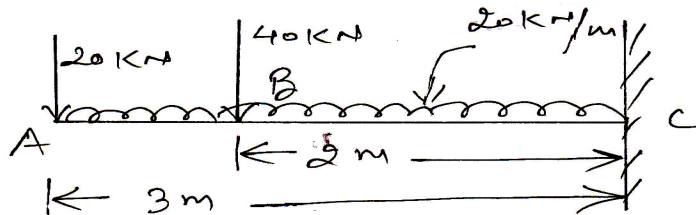


Fig-4

- Q-8. (a) A truck of 30 kN weight running at 50 km/hr on a leveled road is brought to rest in 30 seconds, by applying brakes to avoid an accident. Find the average force of resistance acting on the truck. [10]
- (b) A parachute of 500 N weight falling with uniform acceleration from rest descends 5 meter in the first 4 seconds. Find the resultant air force on the parachute. [10]

Roll No. ....

**Lingaya's University**  
**B.Tech 1<sup>st</sup> Year (Term – III)**  
**Examination – May 2011**  
**Engineering Mechanics (ME - 101)**

[Time: 3 Hours]

[Max. Marks: 100]

Before answering the question, candidate should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

**Note:** – Attempt five questions in all. All questions carry equal marks. Question no. 1 (Section A) is compulsory. Select two questions from Section B and two questions from Section C.

**Section – A**

**Q-1. Part – A**

**Select the correct answer of the following multiple choice questions. [10x1=10]**

- A man stands on a spring weight scale in a lift which carries him upward with acceleration. The reading on the weight scale is
  - True weight of the man
  - Lower than true weight
  - Greater than true weight
  - Unpredictable
- On which of the following parameters the moment of inertia of a body does not depend
  - Distribution of mass in the body
  - Mass of the body
  - Angular velocity of the body
  - All of the above
- If three forces acting in different planes can be represented by a triangle then these forces
  - Will be in partial equilibrium
  - Will be in full equilibrium
  - Will not be in equilibrium
  - None of the above
- A particle has to attain a maximum height of 10 m. What will be its initial velocity?

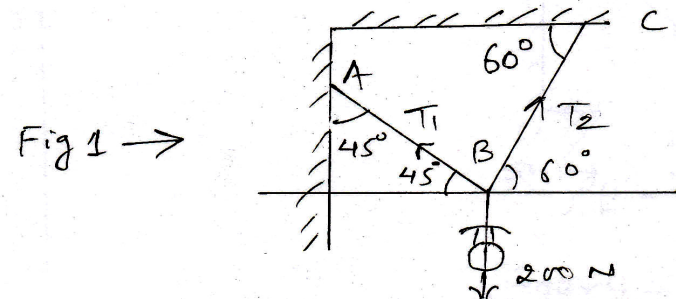
- (a) 18 m/s    (b) 14 m/s    (c) 10 m/s    (d) 7 m/s
- (v) The relation between the number of joints and number of members (m) is related by  
 (a)  $m = 2J + 3$     (b)  $J = 3m + 3$   
 (c)  $m = 2J - 3$     (d)  $J = 3(m - 1)$
- (vi) Moment of inertia of a quadrant about X-X axis is given by  
 (a)  $0.055 R^4$     (b)  $0.04 R^4$   
 (c)  $1.5 R^4$     (d)  $0.075 R^4$
- (vii) Two tensile forces each of magnitude F are acting on a point perpendicular to each other, the resultant force will be  
 (a) zero    (b)  $\sqrt{F}$     (c)  $\sqrt{2F}$     (d)  $\sqrt{2} \cdot F$
- (viii) If the resultant R of two forces P and Q acting at an angle 'θ' with P then  
 (a)  $\tan \theta = \frac{P \sin \theta}{P + Q \cos \theta}$     (b)  $\tan \theta = \frac{P \cos \theta}{P + Q \cos \theta}$   
 (c)  $\tan \theta = \frac{Q \sin \theta}{P + Q \cos \theta}$     (d)  $\tan \theta = \frac{Q \cos \theta}{P + Q \cos \theta}$
- (ix) Relation between elastic constant is expressed by  
 (a)  $K = \frac{3mE}{m-2}$     (b)  $K = \frac{m-2}{3mE}$   
 (c)  $K = \frac{mE}{3(m-2)}$     (d) None of the above
- (x) Poission Ratio is defined as ratio of  
 (a)  $\frac{\text{lateral strain}}{\text{linear strain}}$     (b)  $\frac{\text{linear strain}}{\text{lateral strain}}$   
 (c)  $\frac{\text{Young Modulus}}{\text{linear strain}}$     (d) None of above

### Q-1. Part – B

Explain the term Poission ratio, volumetric strain, shear modulus, bulk modulus, secondary strain. [10]

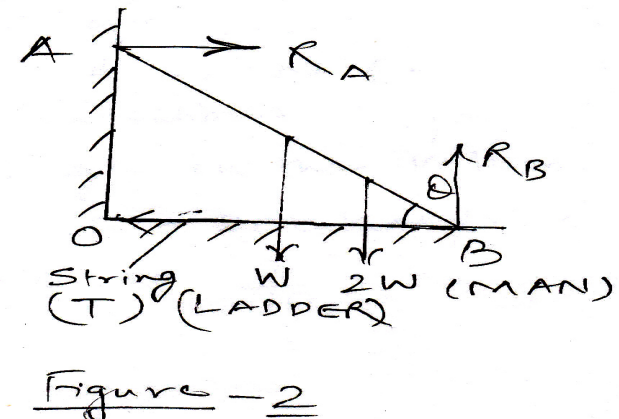
### Section – B

- Q-2. (a) An electric light fixture of weight 200 N is supported as shown in Fig. 1, by two wires. Determine the tensile forces in the wires AB and BC. [12]



- (b) State and prove Varignon's Theorem. [8]

- Q-3. A ladder of weight W and length 2L rests against a smooth wall and horizontal smooth ground. The slipping of ladder is prevented by string of length 'a' and tied up at junction of a wall and floor, and lower end of the ladder. Determine the reactions on the ladder and tension of the string, when a man of 2W weight standing on the ladder at a distance  $\frac{L}{2}$  from the lower end of the ladder. [20]



- Q-4. Find the moment of Inertia about the centroidal X-X and Y-Y axis of Angle section shown in Figure-3. [20]