

Roll No. ....

**24048**

**B. Tech 3rd Sem. (ME)**

**Examination – December, 2015**

**ENGINEERING MECHANICS**

**Paper : ME-205-F**

*Time : Three Hours ]*

*[ Maximum Marks : 100*

*Before answering the questions, candidates 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. Question number 1 is compulsory and attempt at least one question from each Section.*

1. Multiple choice questions :

(i) If the sum of all the forces acting on a body is zero, then the body may be in equilibrium provided the forces are :

- (a) Concurrent                      (b) Parallel  
(c) Like parallel                      (d) Unlike parallel

(ii) Two parallel forces  $F_1$  and  $F_2$  act on a rigid body at points A and B lying on a straight line such that

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A = 5 m. The resultant of these two forces act at a point C lying on AB such that AC : AB = 2:3 are they

(a) Like parallel forces

(b) Unlike parallel forces

(c) Both a and b

(d) None of these

(iii) A moment of a force about any point P is geometrically equal to ..... area of the triangle whose base is the line representing the force and vertex is the point about which the moment is taken

(a) Half

(b) Same

(c) Twice

(iv) The C. G. of a hemisphere lies at a distance of ..... units from its base measured along vertical radius

(a)  $3R/8$

(b)  $3/8R$

(c)  $8R/3$

(v) The moment of Inertia of a triangular section of base b and height h about an axis through its base is given by

(a)  $1/12bh^3$

(b)  $1/18bh^3$

(c)  $1/36bh^3$

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(vi) In method of section, the section must pass through not more than ..... members

(a) 3

(b) 2

(c) 4

(d) 1

(vii) If a particle is moving along the circumference of a circle at a rate 1 m/sec, then the particle is moving with

(a) Uniform velocity

(b) Uniform speed

(c) Average velocity

(d) Average speed

(viii) The bending moment on a section is maximum when shearing force is

(a) Maximum

(b) Minimum

(c) Zero

(d) Changes sign

(ix) The relationship  $S = ut + 1/2at^2$  can be used to the bodies moving with

(a) Any type of motion

(b) Uniform velocity

(c) Uniform acceleration

(d) Both b and c

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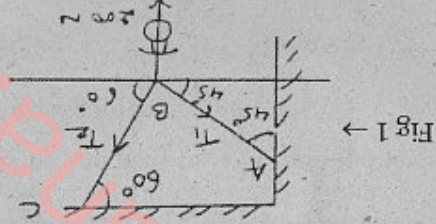


(x) For a perfect truss having 13 members, the number of joints must be equal to

- (a) 6
- (b) 8
- (c) 10
- (d) 13

**SECTION - A**

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.

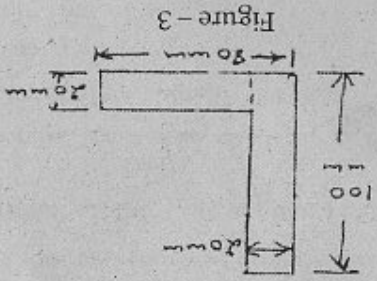


(b) State and prove Varignon's Theorem.

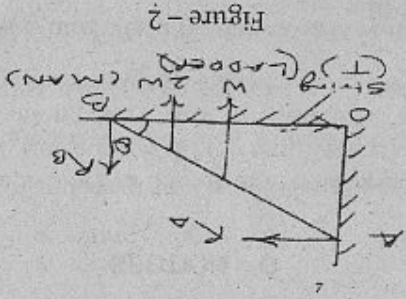
3. A ladder of weight  $W$  and length  $2L$  rests against a smooth wall and horizontal smooth ground. The slipping of ladder is prevented by string of length  $\frac{L}{2}$  and tied up at junction of a wall and floor, and lower end of the ladder. Determine the reactions on the ladder and tension, 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.

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



**SECTION - B**



5. A truss is loaded and supported as shown in fig. 3. Find the axial forces on member DC, DE and BE. 20

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9. (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

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### SECTION - C

6. 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  $\frac{10}{3}$ . 20

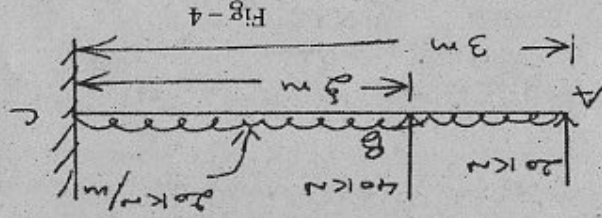
7. A solid shaft of 20 cm diameter has the same cross sectional area as the hollow shaft of same material with inside diameter of 15 cm.

- (a) Find the ratio of horse powers transmitted by the two shafts at the same angular velocity.

- (b) Compare the angles of twist in equal length of these shafts, when stressed to the same intensity.  $2 \times 10 = 20$

### SECTION - D

8. Draw shear force and bending moment diagram for cantilever beam shown in Figure-4. 20



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