



Printed Pages : 4

ME – 202

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

**PAPER ID : 4035**

Roll No.

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## B. Tech.

(SEM. II) EXAMINATION, 2006-07

### ENGINEERING MECHANICS

Time : 2 Hours]

[Total Marks : 50

- Note : (i) Attempt *all* questions.  
(ii) Assume missing data suitably, if any.

1 Attempt any **four** of the following : **3.5×4=14**

- (a) Explain the law of transmissibility of forces.  
(b) A particle is acted by following forces.  
(1) 200 N inclined  $30^\circ$  with east towards north  
(2) 250 N towards the north  
(3) 300 N towards the north west  
(4) 350 N inclined at  $40^\circ$  with west towards south

Find the resultant of all forces and its direction.

- (c) Four forces equal to P, 2P, 3P and 4P are acting along the four sides of a square ABCD as shown in figure. Find the magnitude, direction and position of resultant forces.

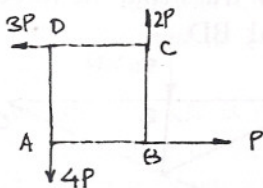


Fig. 1

- (d) A smooth circular cylinder of radius 2 m is lying in a triangular groove, one side of which makes  $20^\circ$  and other side makes  $40^\circ$  angle with the horizontal. Find the reaction at the surfaces of contact, if there is no friction and the cylinder weighs 2 kN.

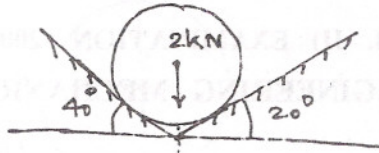


Fig. 2

- (e) Briefly explain the Varignon's Principle.  
 (f) Draw the bending moment diagram of the cantilever beam shown in the figure.

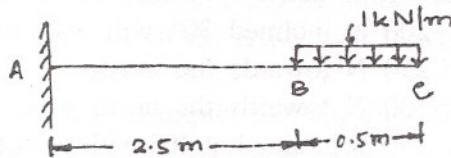


Fig. 3

2 Attempt any **four** of the following : **3×4=12**

- (a) Differentiate between an imperfect truss, perfect truss and redundant truss.  
 (b) For the given truss find the forces in members BC, CD and BD.

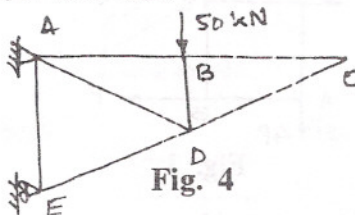
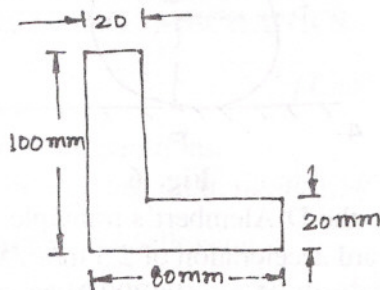


Fig. 4

- (c) Find the centroid of a uniform wire bent in form of a quadrant of the arc of a circle of radius  $R$ .
- (d) State the parallel axis theorem.
- (e) What is product of inertia ? What will the product of inertia of a circular disc about its centroidal axis ?
- (f) Find the second moment of area of the given L-section about the centroidal  $x$  axis as shown in **Fig.5**



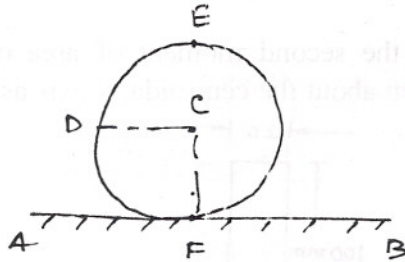
**Fig. 5**

3 Attempt any two of the following : **6×2=12**

- (a) The pitch of a single thread screw jack is 6 mm and its mean diameter is 60 mm. If the coefficient of friction is 0.1, determine the force required at the end of a 250 mm long lever from the axis of the screw to (i) raise a load of 48 kN (ii) lower the same load. Is the screw self locking?
- (b) A belt is running over a pulley of diameter 1000 mm at 450 rpm. The angle of contact is  $150^\circ$  and the coefficient of friction is 0.35. If the maximum tension in the belt is limited to 1 kN, determine the power transmitted by it.
- (c) A car weighing 4 kN is moving at a speed of 200 m/s. The resistance to the car is largely due to the air drag which is equal to  $0.005 v^2$ . What distance will it travel before its speed is reduced to 100 m/s ?

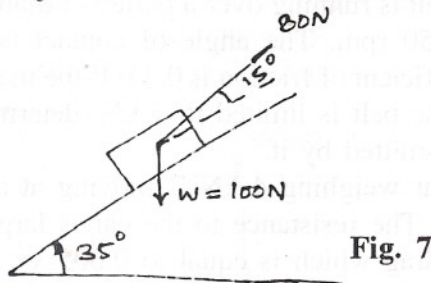
4 Attempt any **two** of the following : **6×2=12**

- (a) A cylinder of radius 80 mm rolls without slipping along a horizontal plane AB. Its center has a uniform velocity of 15 m/s. Find the velocities of points D and E on the rim of the cylinder.



**Fig. 6**

- (b) State the D'Alembert's principle. A lift has an upward acceleration of  $2.5 \text{ m/s}^2$ . What pressure will a man of weight 800 N exert on the floor of the lift ? Determine the pressure by him if the acceleration of lift is  $2.5 \text{ m/s}^2$  downwards. Assume  $g = 9.8 \text{ m/s}^2$ .
- (c) With suitable examples explain the difference between conservative and non-conservative forces. An object weighing 100 N is pulled up by a 80 N force up an inclined smooth plane as shown in **Fig.7**. Determine the velocity of the object after it has moved 4 m.



**Fig. 7**