

**I B. Tech II Semester Supplementary Examinations, April/May - 2018**  
**ENGINEERING MECHANICS**

(Com. to ECE, EEE, EIE, Bio-Tech, E Com E, Agri E)

Time: 3 hours

Max. Marks: 70

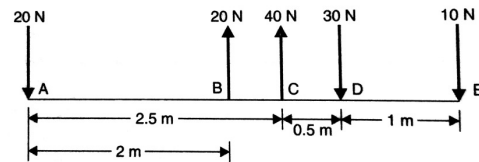
- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answering the question in **Part-A** is Compulsory  
 3. Answer any **THREE** Questions from **Part-B**

**PART -A**

1. a) Define and explain the moment of a force. Differentiate between clockwise (4M)  
moment and anti-clockwise moment.
- b) Explain and define the term: free body diagram. Draw the free body diagram of a (5M)  
ball of weight  $W$ , placed on a horizontal surface.
- c) Define centre of gravity and centroid. (3M)
- d) State the theorem of perpendicular axis. (3M)
- e) What are the differences between ``kinematics`` and ``kinetics``? (3M)
- f) Write the work-energy equation in case of fixed axis rotation. (4M)

**PART -B**

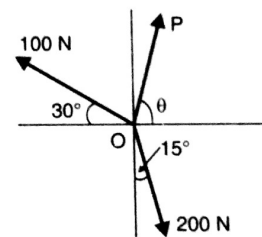
2. a) Five forces are acting on a body as shown in figure. Determine the (7M)  
resultant.



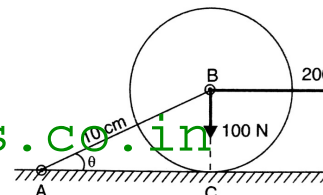
- b) A uniform ladder of length 13m and weighing 30N is placed against a smooth (9M)  
vertical wall with its lower end 10m from the wall. In this position the ladder is  
just to slip. Determine:

- i) The coefficient of friction between the ladder and the floor and
- ii) Frictional force acting on the ladder at the point of contact between  
ladder and floor.

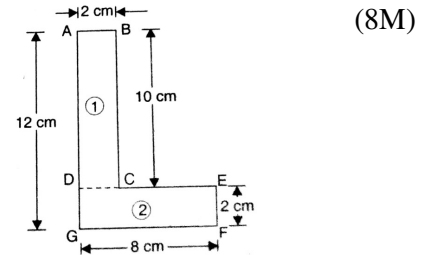
3. a) Three forces of magnitudes  $P$ , 100N and 200N are acting at a point  $O$  as shown in figure. Determine the (7M)  
magnitude and direction of the force  $P$ .



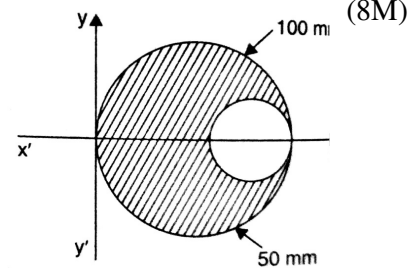
- b) A circular roller of radius 5cm and of weight 100N (9M)  
rests on a smooth horizontal surface and is held in  
position by an inclined bar  $AB$  of length 10cm as  
shown in figure. A horizontal force of 200N is acting  
at  $B$ . Find the tension (or force) in the bar  $AB$  and the  
vertical reaction at  $C$ .



4. a) Find the centre of gravity of the L-section shown in figure.

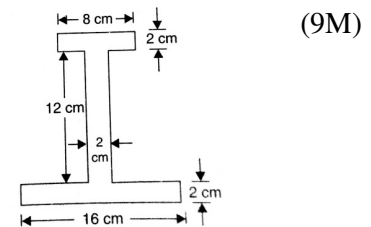


- b) From a circular plate of diameter 100mm a circular part of diameter 50mm is cut as shown in figure. Find the centroid of the remainder.



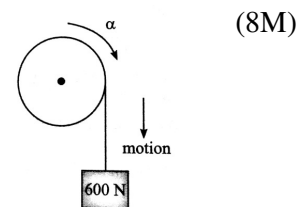
5. a) Find the mass moment of inertia of an aluminum pipe of 120mm outer diameter and 90mm inner diameter and 2.5m height about its longitudinal axis. (density,  $\rho=2560\text{kg/m}^3$ ).

- b) For the I-section shown in figure, find the moment of inertia about the centroidal axis X-X perpendicular to the web.



6. a) Two cars are travelling towards each other on a single lane road at the velocities 12m/s and 9m/s respectively. When 100m apart, both drivers realize the situation and apply their brakes. They succeed in stopping simultaneously and just start of colliding. Determine i) The time required to cars to stop; ii) Distance travelled by each car while slowing down; iii) Deceleration of each car.

- b) A pulley of weight 400N has a radius of 0.6m. A block of 600N is suspended by a rope wound round the pulley as shown in figure. Determine the resulting acceleration of the weight and tension in the rope.



7. a) A train of weight 1600kN is ascending a slope of 1 in 100 with a uniform speed of 36kmph. Find the power exerted by the engine, if the road resistance is 5N per kN weight of the train.

- b) A block of weight 10N falls on a spring with stiffness 1kN/m from a height of 1m. Determine the maximum deflection in the spring, if the resulting motion is vertical.

