

I B. Tech I Semester Supplementary Examinations, May/June - 2019
ENGINEERING MECHANICS

(Com. to CE,EEE,ME,Aero E,Auto E,Bio-Tech,Chem E, Min E,Metal E, PE, PChem E)

Time: 3 hours

Max. Marks: 70

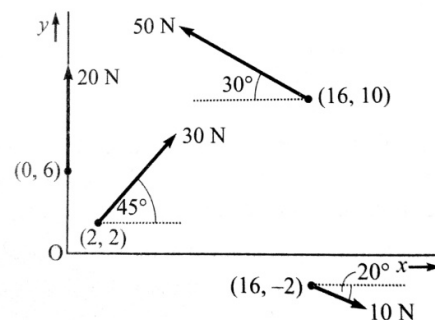
- Note: 1. Question paper consists of two parts (**Part-A** and **Part-B**)
 2. Answering the question in **Part-A** is Compulsory
 3. Answer any **FOUR** Questions from **Part-B**
- ~~~~~

PART -A

1. a) Explain the phenomenon of friction by taking an example of a block placed on a rough surface. (2M)
- b) Define the free body diagram of a body in an equilibrium system, and explain its importance. (2M)
- c) What are the conditions under which the centre of gravity of a body becomes the same as its centroid? (2M)
- d) Differentiate between polar moment of inertia and product of inertia. (2M)
- e) Discuss the difference between curvilinear and rectilinear motion. (2M)
- f) State the work-energy equation for translation. (2M)
- g) State D'Alembert's principle. (2M)

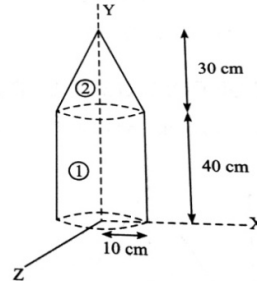
PART -B

2. a) Define moment of force about a point and show that the algebraic sum of the moments of two coplanar forces about a point is equal to the moment of their resultant about that point. (6M)
- b) A uniform ladder of weight 800N and of length 7 m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is 60° . When a man of weight 600N stands on the ladder at a distance 4m from the top of the ladder, the ladder is at the point of sliding. Determine the coefficient of friction between the ladder and the floor. (8M)
3. a) The resultant of two concurrent forces is 2500N and the angle between the forces is 90° . The resultant makes an angle of 46° with one of the forces. Find the magnitude of each force. (6M)
- b) Determine the resultant of the non-concurrent, non-parallel system of forces shown in the figure. Assume that the coordinates are shown in meters. (8M)



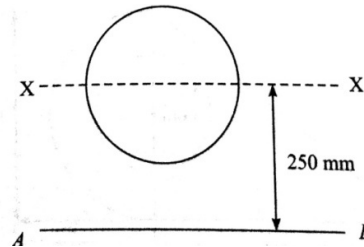
4. a) Determine the area generated by rotating a line of length l about x-axis from a distance r using Pappus theorem. (6M)

- b) Determine the centre of gravity of the following figure. (8M)



5. a) State and prove transfer formula for product of inertia. (6M)

- b) A circle of diameter 120mm is placed above on axis AB in such a way that its centre is 250mm above the axis AB as shown in figure. Using parallel axis theorem, determine moment of inertia about reference axis AB and also determine polar moment of inertia. (8M)



6. a) An elevator is moving upwards with a constant speed of 10m/s. If a man standing inside the elevator drops a coin from a height of 2.45m, find the time taken by the coin to reach the floor of the elevator. ($g=9.8\text{m/s}^2$). (6M)

- b) Two trains R and S start from rest simultaneously from stations A and B facing each other with accelerations 0.5 m/s^2 and $2/3\text{ m/s}^2$ reaching their maximum speeds of 90 kmph and 72 kmph respectively. If they cross each other midway between the stations, find the distance between the stations and the time taken by each other. (8M)

7. a) A body of weight 2000N moves on a level horizontal rough road for a distance of 200m. The resistance of the road is 10N per 1000N weight of the body. Find the work done by the resistance on the body. (6M)

- b) A bullet of 25 g mass is fired with a speed of 400 m/s. What is its kinetic energy? (8M)
If the bullet can penetrate 20 cm in a block of wood, what is the average resistance of the wood? If the bullet were fired into a similar block of 10 cm thick wood, what would be the exit speed?

