

## I B. Tech I Semester Supplementary Examinations, August/Sep- 2022

## ENGINEERING MECHANICS

(Com. to AME, Min E)

Time: 3 hours

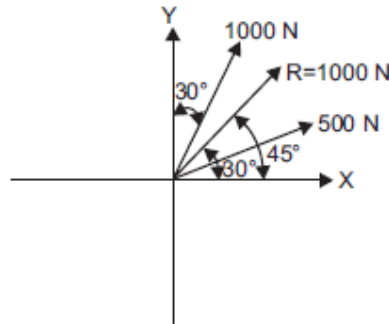
Max. Marks: 70

Answer any five Questions one Question from Each Unit

All Questions Carry Equal Marks

## UNIT-I

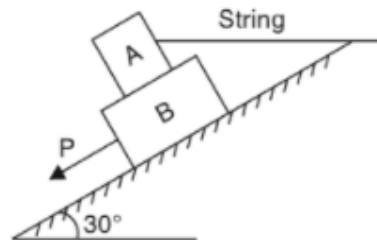
- 1 a) Two forces acting on a body are 500 N and 1000 N as shown in Figure. Determine the third force  $F$  such that the resultant of all the three forces is 1000 N directed at  $45^\circ$  to x-axis. (8M)



- b) Define the following: (6M)
- Angle of friction
  - Limiting friction
  - Cone of friction

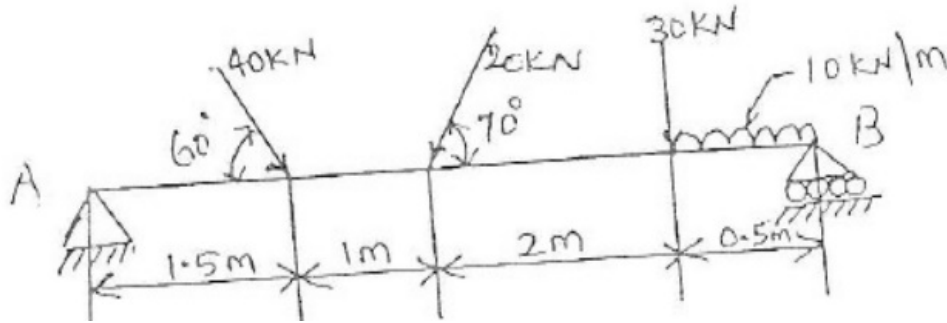
Or

- 2 a) What is a couple? State its properties. Distinguish between couple and moment. (6M)
- b) Two blocks A and B weighing 180 N and 270 N are supported on a  $30^\circ$  rough plane shown in Figure.. Block A is tied up by a horizontal string and a downward pull  $P$ , parallel to the plane is applied to the block B. if  $\mu = 0.4$ . Find the tension in string and the pull  $P$ . (8M)



**UNIT-II**

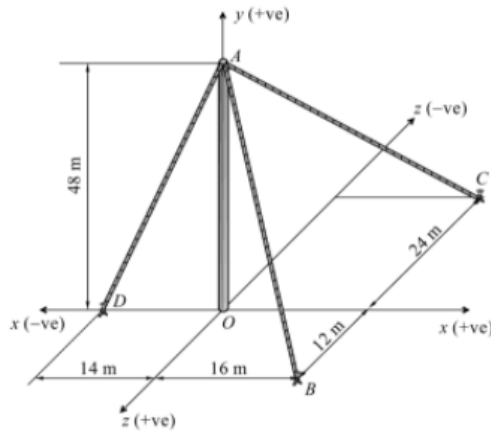
3 a) Find reactions at points A & B of following (7M)



b) Discuss the graphical method of finding resultant of coplanar forces. (7M)

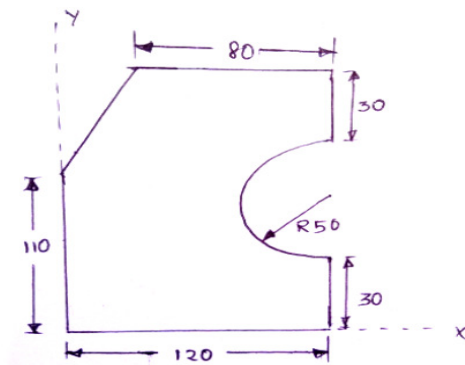
**Or**

4 Figure. Knowing that the tension in AC is  $T_{AC} = 20 \text{ kN}$ . Determine the required values of tension  $T_{AB}$  and  $T_{AD}$  so that the resultant of the three forces applied at A is vertical and calculate resultant. (14M)



**UNIT-III**

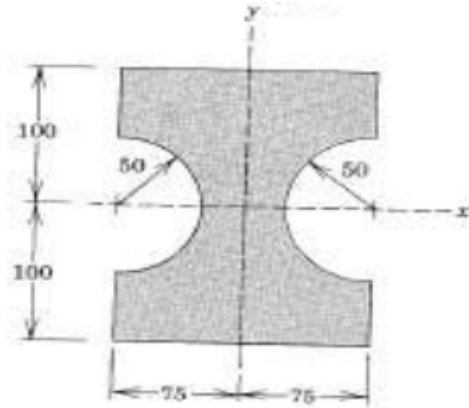
5 a) Locate the centroid of the area shown in Figure below. The dimensions are in mm. (7M)



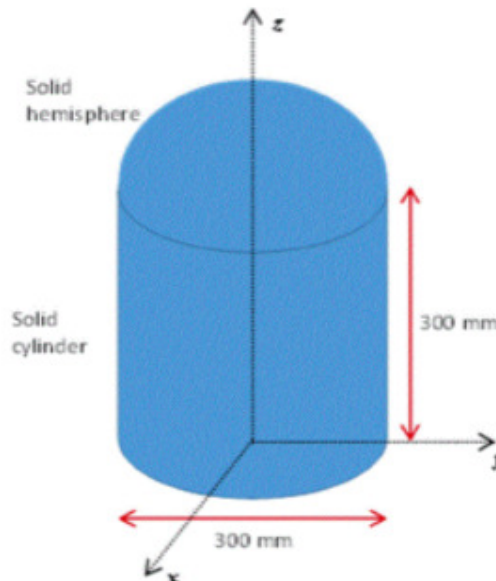
- b) Locate the centre of gravity of the right circular cone of base radius  $r$  and height  $h$  (7M)

Or

- 6 a) Calculate the moment of inertia of the shaded area about the x-axes and y-axes. (7M)



- b) The hemisphere and cylinder assembly is made of homogeneous material having a mass density of  $7850 \text{ kg/mm}^3$ . Determine the mass moment of inertia about the z axis and the x axis. (7M)



#### UNIT-IV

- 7 a) Define motion? what is the difference between rectilinear and curvilinear motions. (6M)
- b) A bullet moving at the rate of  $250 \text{ m/sec}$ , is fixed into a log of wood. the bullet penetrates to a depth of  $40 \text{ cm}$ . if the bullet moving with the same velocity is fired into a similar piece of wood  $20 \text{ cm}$  thick, with what velocity would emerge. Take the resistance to be uniform in both the cases. (8M)

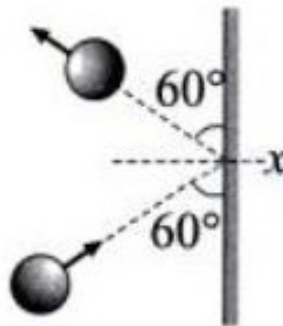
Or



- 8 a) A train is traveling from A to D along the track shown in Figure. Its initial velocity at A is zero. The train takes 5 min to cover the distance AB, 2250 m length and 2.5 minutes to cover, the distance BC, 3000 m in length, on reaching the station C, the brakes are applied and the train stops 2250 m beyond, at D (i) Find the retardation on CD, (ii) the time it takes the train to get from A to D, and (iii) its average speed for the whole distance. (10M)
- b) A stone is thrown upwards from the top of a tower 70 m high with a velocity of 19.2 m/s. Determine its position and velocity when  $t = 6$  seconds. (4M)

### UNIT-V

- 9 a) A 5 kg steel ball strikes a massive wall with a speed of 15 m/sec at angle of  $60^\circ$  with the surface. It bounces off with the same speed and angle shown in Figure. below. If the ball is in contact with the wall for 0.20 sec, what is the average force exerted on the ball by the wall. (10M)



- b) State the applications work-energy method. (4M)

Or

- 10 a) A 5 gms bullet is fired horizontally into a 1.5 kg wooden block resting on a horizontal surface. The coefficient of kinetic friction between and surface is 0.23. The bullet remains embedded in the block, which is observed to slide 0.25 m along the surface before stopping. What was the initial speed of the bullet. (8M)
- b) What is the difference between impulse and impulsive force. Deduce the relation between impulse and momentum. (6M)

