

**TEEGALA KRISHNA REDDY ENGINEERING COLLEGE**  
(UGC – AUTONOMOUS)

**B TECH II Semester Examinations, September 2021**

**(Common to CE)**

**ENGINEERING MECHANICS**

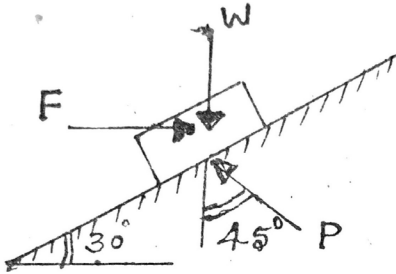
**Answer any Five questions**

**All questions carry equal marks**

**Time : 3 Hours**

**Max. Marks : 75**

1. A) A block shown in figure is acted upon by its weight  $W=400\text{N}$  and a horizontal force  $F=600\text{N}$  and also the pressure  $P$  exerted by the incline. The resultant of these forces is parallel to the incline. Find  $P$  and  $R$ . Does the block move up or down the incline. [ 5M]



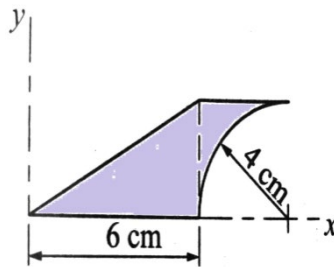
- B) If the force multiplier of a force  $P$  acting from  $A$  to  $E$  is  $P_m=20\text{N/m}$ , referring figure, find the following [ 10M]
- Component of  $P$  along  $AC$
  - Moment of  $P$  about  $D$ .

2. A) Define i) angle of friction ii) cone of friction iii) angle of repose iv) limiting friction  
v) static and dynamic friction [5M]

- B) A horizontal bar 10 m long and of negligible weight rests on rough inclined plane as shown in the figure. If the angle of friction is  $15^\circ$ , how close to B may the 200N force be applied before motion impends. [10M]

3. A) State and prove parallel axis and perpendicular axis theorem of area moment of inertia. [5M]

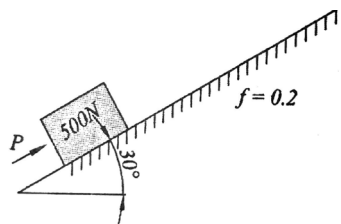
- B) Find the moment of inertia of the shaded area shown in the figure about x-axis and y-axis. [10M]



4. A) A body starts from rest and its acceleration expressed as  $a = 12t - 6t^2$  where  $t$  is time in seconds and acceleration in  $m/sec^2$ . Find the time required for the body to return to its starting position and also its velocity at that time. What is the maximum distance travelled before starting its return motion? [5M]

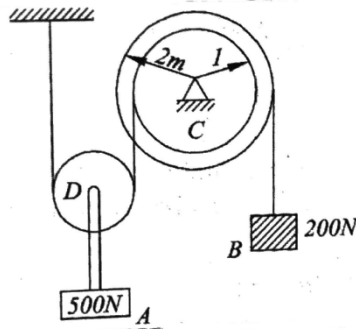
- B) A block of weight 500N, starts from rest due to a force  $P=1000N$ , and moves over a rough incline surface as shown in the figure. After moving by 15m up along the incline, the force  $P$  is then removed. Find the velocity of the block when it regains its original position. Use work energy principle.

[10M]



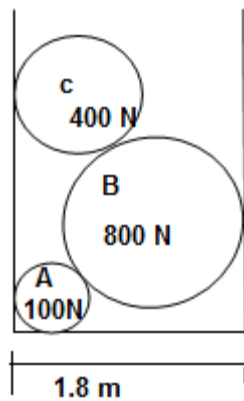
5. A) Explain the salient features of instantaneous method to solve problems of kinematics of rigid bodies. [5M]

- B) Determine the acceleration of the body A in the figure, assuming the pulleys to be frictionless and negligible weight. [10 M]



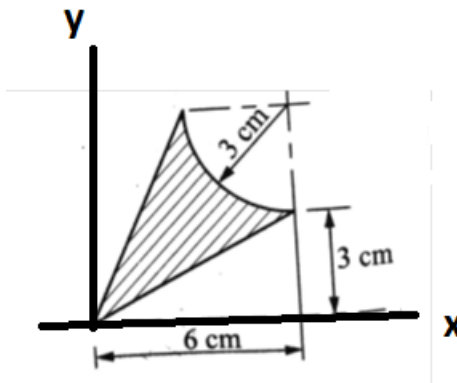
6. A) Draw the given system of forces and write their conditions of equilibrium for  
 i) Coplanar non concurrent system  
 ii) Spatial non concurrent system  
 iii) Spatial forces parallel to y-axis and intersecting x-axis.  
 iv) Coplanar forces intersecting x-axis.  
 v) Define free body diagram and active force diagram. [5M]

- B) Three cylinders are piled in a rectangular ditch. Neglecting the friction, determine the reaction between cylinder A and the vertical wall. Radius of cylinders A,B and C are 0.4 m, 0.6 m and 0.5 m respectively. [10M]



7. A) Find the mass moment of inertia of a sphere of radius  $r$  w.r.t centroidal axis. [5M]

- B) Find the centroid of the shaded area shown in the figure. [10M]



8. A) Explain Impulse and Momentum method for translation, rotation and plane motion [5M]

B) A flywheel of mass 100 kg and radius of gyration 30 cm supports a block of mass 25 kg through a cord wrapped around its rim of radius 40 cm as shown in the fig- If the system is released from rest, find the acceleration of the block and its speed after falling through a height of 2 m. [10M]

