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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR  
(AUTONOMOUS)

B.Tech. I Year II Semester Supplementary Examinations, March-2021

ENGINEERING MECHANICS

(Common to CE, ME & AGE)

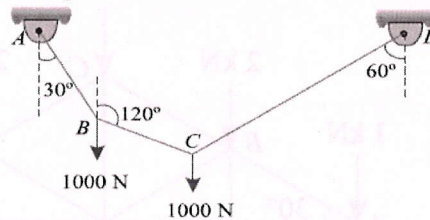
Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 A string ABCD, attached to fixed points A and D has two equal weights of 1000 N attached to it at B and C. The weights rest with the portions AB and CD inclined at angles as shown in figure. Find the tensions in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is  $120^\circ$ ? **12M**



OR

- 2 a What are the different types of supports and support reactions and explain with sketches? **6M**  
b State and explain the principle of Transmissibility of a force. **6M**

**UNIT-II**

- 3 a Prove that the angle of friction ( $\Phi$ ) is equal to the angle made by an inclined plane with the horizontal when a solid body, placed on the inclined plane, is about to slide down. **6M**  
b A body of weight 500N is pulled up on an inclined plane, by a force of 350N. The inclination of the plane is  $30^\circ$  to the horizontal and the force is applied parallel to the plane. Determine the coefficient of friction? **6M**

OR

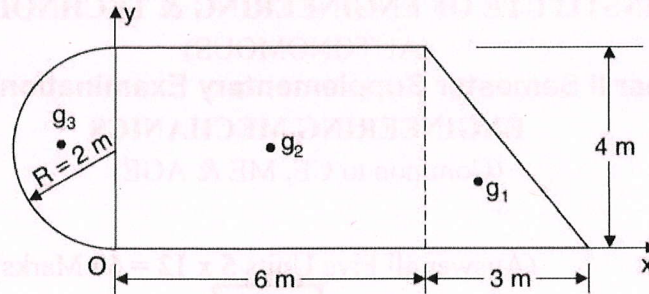
- 4 a What is the differential screw jack? Explain the working principle of the same with neat sketch. **5M**  
b A screw jack has square threads of mean diameter of 100mm and a pitch of 12.5mm. Determine the force that must be applied to the end of 500mm lever (i) to raise, and (ii) to lower, a weight of 50KN? Find the efficiency of the jack? Is itself locking? Assume  $\mu=0.20$ . **7M**

**UNIT-III**

- 5 a State and prove the parallel axis theorem in the determination of moment of inertia of areas with the help of a neat sketch. **6M**  
b Derive an equation for moment of inertia of the following sections about centroidal axis:  
i) Rectangular section, ii) Circular section. **6M**

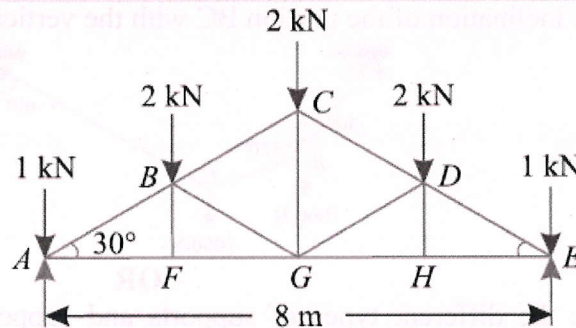
OR

- 6 Determine the centroid of the area shown in figure with respect to the axes shown? 12M



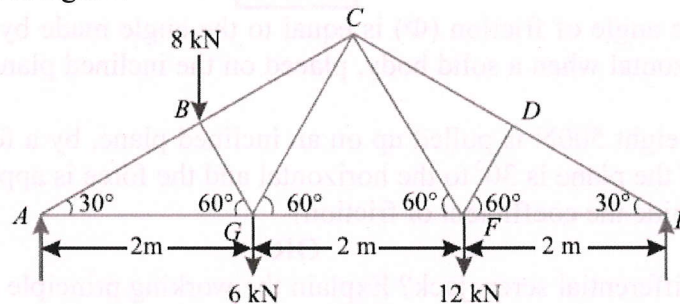
**UNIT-IV**

- 7 A king post truss of 8 m span is loaded as shown in figure. Find the forces in each member of the truss and tabulate the results? 12M



OR

- 8 Determine the nature and magnitude of the forces in the members BC, GC and GF of the truss shown in figure? 12M



**UNIT-V**

- 9 A small steel ball is shot vertically upwards from the top of building 50 m above the street with an initial velocity of 25 m/sec. 12M  
 (i) In what time, it will reach the maximum height?  
 (ii) How high above the building will the ball rise?  
 (iii) Compute the velocity with which it will strike the street and the total time for which the ball is in motion?

OR

- 10 A body moves along a straight line and its acceleration (a) which varies with time (t) is given by  $a = 2 - 3t$ . After 5 seconds, from start of observations, its velocity is observed to be 20 m/s. After 10 seconds, from start of observation, the body was at 85 metres from the origin. Determine: 12M  
 (i) its acceleration and velocity at the time of start,  
 (ii) distance from the origin at the start of observations,  
 (iii) the time after start of observation in which the velocity becomes zero?

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