

18/05/2015

FE-(I) - Old.

Engg. Mechanics .

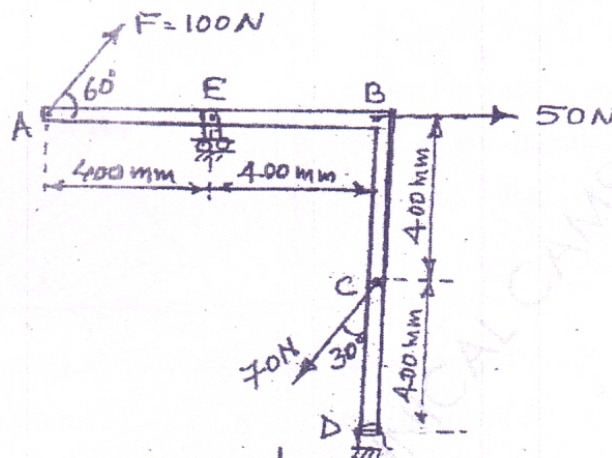
[6 Pages]

(OLD COURSE)
(3 Hours)

QP Code : 3082
[Total Marks : 100]

- N.B.:- 1) Question No.1 is compulsory
2) Attempt any three out the remaining questions
3) Draw neat sketches to illustrate your answers
4) Figures to the right indicate full marks

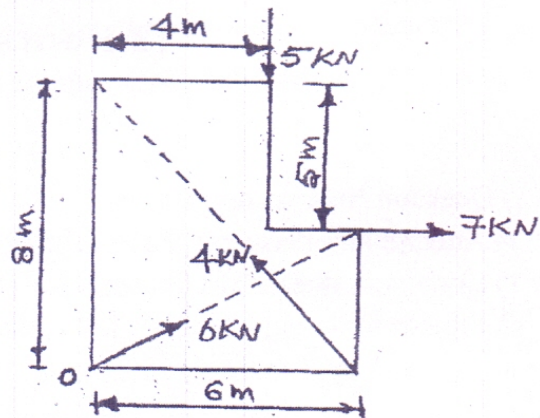
1. a) Replace the given force system as single force –moment system at C [04]



- b) Explain perfect and imperfect truss, stable and unstable truss. [04]
- c) Derive an expression to find the centrifugal tension in a belt drive. [04]
- d) A stone is dropped from the ground surface into a well and the sound of splash is heard 2.5 seconds later. How far below the surface of water from the ground level. Assume the velocity of sound as 330 m/s [04]
- e) A wooden block of 7 N resting on floor ($\mu=0.4$) is fired with a bullet of 0.25 N weight at a velocity of 150 m/s, and it is embedded into the block. Find [04]
- The velocity of bullet and block together after the impact
 - The distance travelled by the combined mass along the floor.

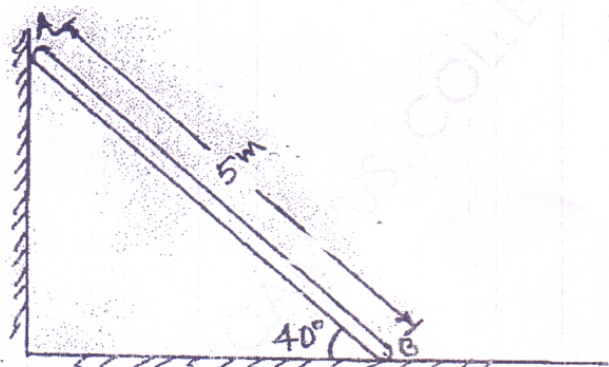
[TURN OVER

2. a) Find the Resultant of general force system shown below and locate it w.r to O.



[08]

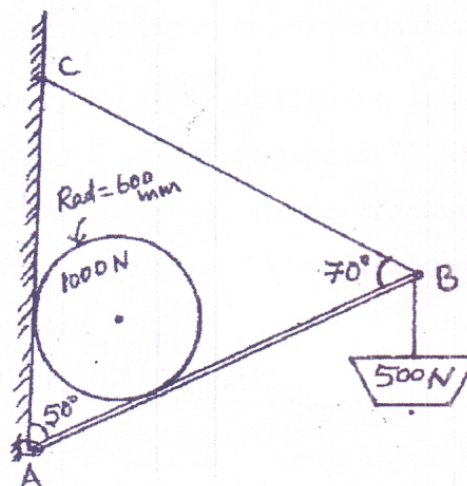
- b) A Ladder of weight 20kg is kept as shown in figure. Check whether the ladder is in equilibrium. If not, What is the minimum angle at which the ladder will be in equilibrium?



[06]

- c) A rocket follows the a path such that the acceleration is given by $\hat{a} = (4 \hat{i} + t \hat{j})$ $[06]$ m/s^2 . At $t = 10$ sec determine (i) sped of the rocket (ii) radius of curvature of the path (iii) magnitude of Normal and Tangential components of accelerations

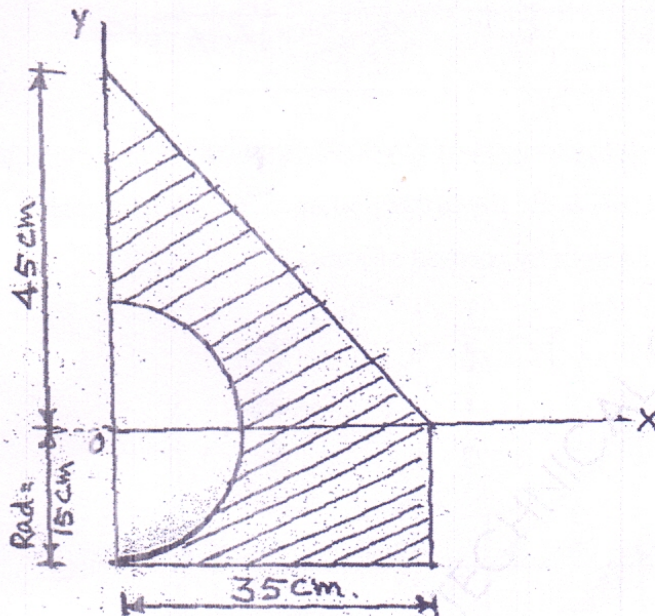
3. a) A sphere of weight 1000 N is held in equilibrium as shown in figure. Determine the reaction at Hinge A and the Tension on the string BC.



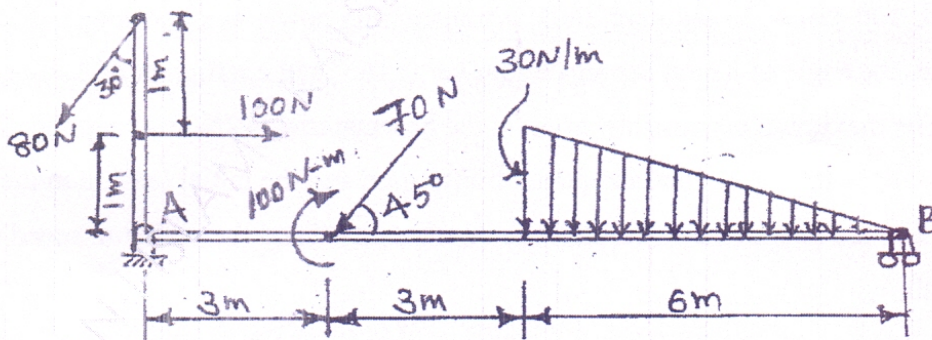
[08]

[TURN OVER

- b) A boy throws a ball from a height of 2m from ground with a velocity of 24m/s at an angle ' α ' to hit a wall from a distance of 30m from the wall. Determine the maximum height h that can be reached by the ball and the corresponding angle ' α '. [06]
- c) What is general plane motion? Explain Instantaneous center of rotation [06]
4. a) For the figure given below, locate the centroid of the shaded area with respect to given x-axis and y axis. [04]

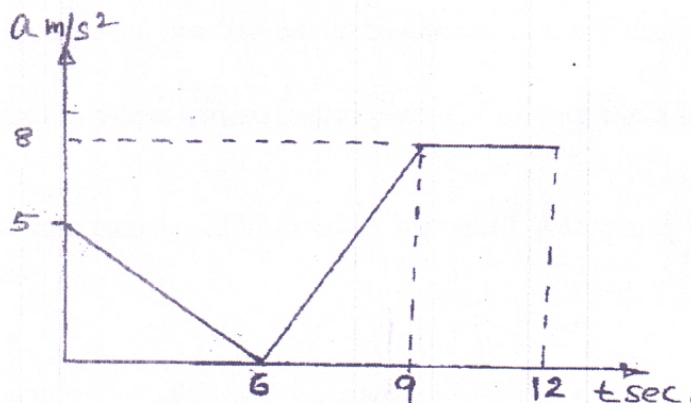


- b) Determine the support reactions at A and B of the Beam shown below [08]



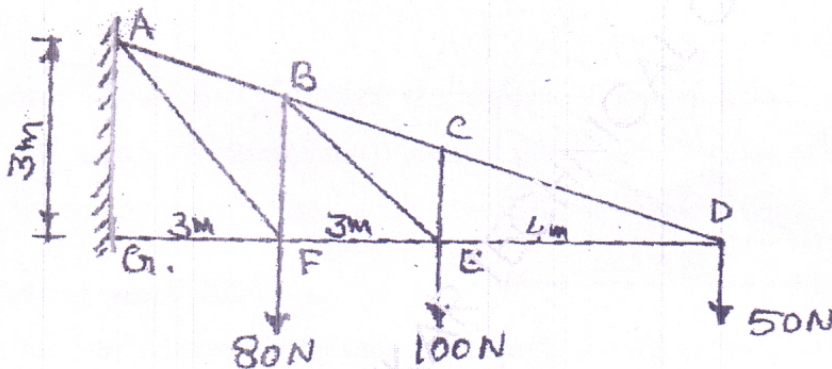
[TURN OVER

- c) Acceleration – time (a-t) diagram for a particle moving in a straight line is shown below. Draw the v-t and x-t diagrams. [08]



5. a) Find

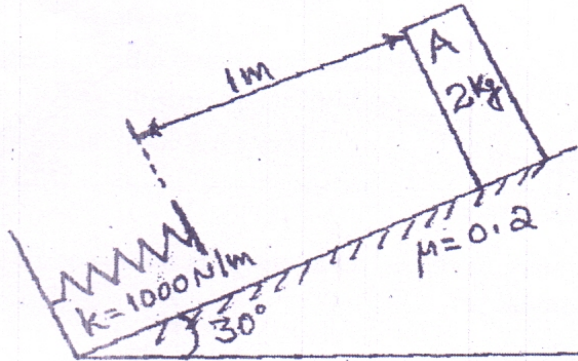
- (i) The reactions at the support of the truss given below.
 (ii) Forces on BC, BE & EF by method of section.
 (iii) Other member forces by method of joints.



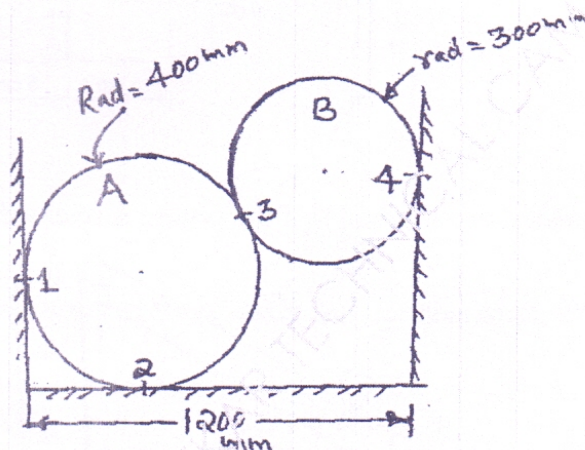
- b) A belt, 100 mm wide and 8mm thick is transmitting power at a belt speed of 1600 m/min. the angle of lap on the smaller pulley is 165° and coefficient of friction is 0.3. The maximum permissible stress in the belt material is 2N/mm^2 and the mass of the belt is 0.9 kg/m . Find the power transmitted and the initial tension in the belt. Also find the maximum power that can be transmitted and the optimum speed of the belt. [08]

[TURN OVER

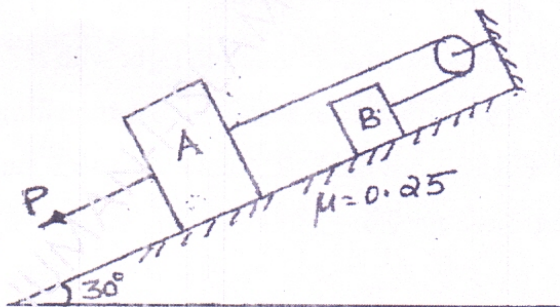
- c) Block A of mass 2Kg is released from rest as shown in figure. It strikes a spring ($K = 1000\text{N/m}$) on its way. Determine the maximum compression of the spring and the maximum velocity of the block. [06]



6. a) Two spheres A (weight = 800 N) and B (weight = 500N) are kept in a vessel as shown. Determine the reactions at 1,2,3 and 4 [06]

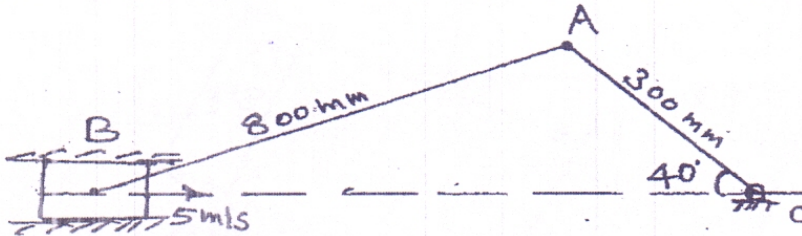


- b) Two blocks A and B are connected as shown. Find the force P required to just move block A down the plane. $W_A = 5\text{ kg}$, $W_B = 6\text{ kg}$. [06]

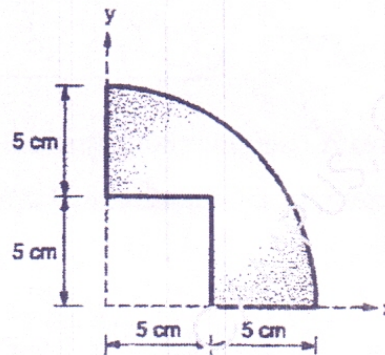


[TURN OVER

- c) Locate the Instantaneous center of rotation for crank and connecting rod [08]
mechanism and find the angular velocity of crank OA if the velocity of B is 5m/s to
right.



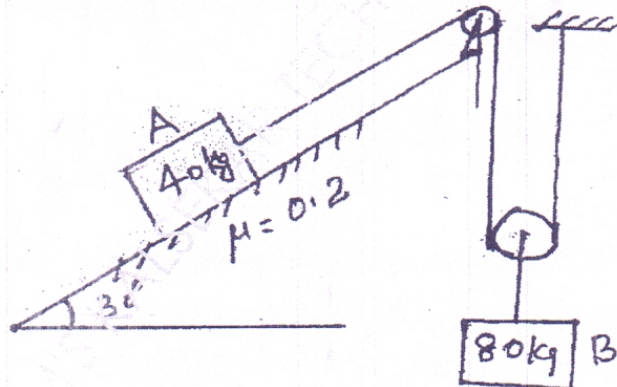
7. a) Determine the moment of
Inertia of the shaded area
about given X and Y Axis.



[06]

- b) Determine the acceleration on A and B if the system is released from rest.

[08]



- c) A smooth spherical ball A of mass 250 gm is moving from left to right with a
velocity of 2 m/s in a horizontal plane. Another ball B of mass 15 gm is travelling in
the perpendicular direction to A with a velocity of 6 m/s. If A collides with B find
the velocity of A and B after collision. Take $e = 0.6$.

— x —

Course: Engineering Mechanics.(prog-568)

Q.P Code: 3082

Correction:

In N.B. 2nd note

Read As:

Attempt **Any Four** out of the remaining questions.

Instead of :

Attempt **Any Three** out of the remaining questions.

Query Update time: 18/05/2015 11:05AM