I B. Tech II Semester Supplementary Examinations, Jan/Feb-2024
ENGINEERING MECHANICS
(Civil Engineering)

Time: 3 hours   Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks
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UNIT-I

1 a) Find resultant of given system of forces as shown in figure   [10M]
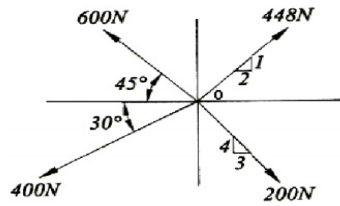.

Figure:

   b) Explain coefficient of friction and cone of friction.   [4M]

(OR)

2 a) What do you mean by limiting friction and impending motion? Explain?   [4M]

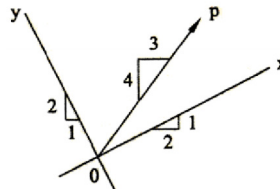   b)   If the X component is as shown in figure of P is 893 N, determine P and its Y   [10M]
       component.

Figure:

UNIT-II

3 a) A ball of weight W rests upon a smooth horizontal plane and has attached to its   [8M]
       center two strings AB and AC which pass over friction less pullies at B and C
       and carry loads P and Q, respectively, as shown in the figure. If the string AB is
       horizontal, find the angle α that the string AC makes with the horizontal when
       the ball is in a position of equilibrium. Also find the pressure R between the ball
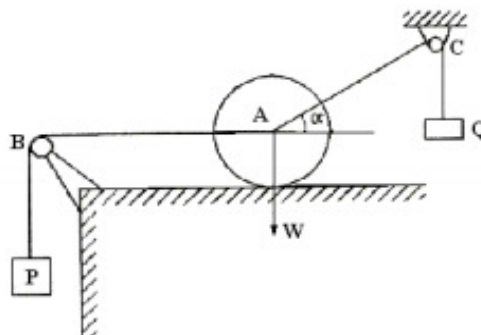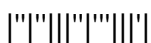   and the plane.

Figure:

|"|"|||"|"|||'|

b) Explain the equations of equilibrium of coplanar systems in detail. [6M]

4 a) Define and explain free body diagram and resultant of a force? [4M]

b) Two identical rollers, each of weight 100 N, are supported by an inclined plane [10M] and a vertical wall as shown in figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C.
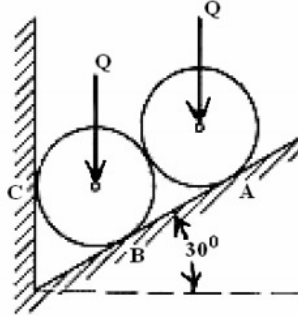

Figure:

UNIT-III

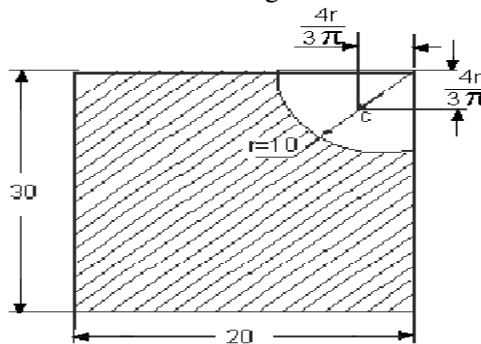5 a) Find the centroid of the area shown in Figure. All dimensions are in cm. [10M]

Figure:

b) State laws of friction? [4M]

(OR)

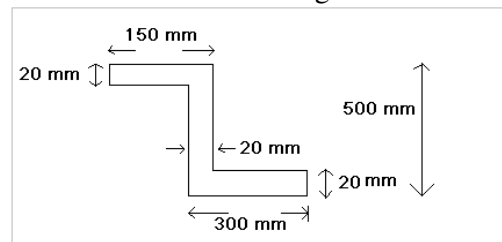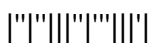6 a) Find the centroid of the 'Z' section shown Figure? [7M]

Figure:

b) A ladder 5m long and of 250N weight is placed against a vertical wall in a [7M] position where its inclination to the vertical is 30^0. A man weighing 800N climbs the ladder. At what position will he induce slipping? The co-efficient of friction for both the contact surfaces of the ladder viz. with the wall and the floor is 0.2.

|'|'|'|||'|'''|||'|

UNIT-IV

7   a)   Find the moment of inertia about the horizontal centroidal axis as shown in Figure.   [7M]
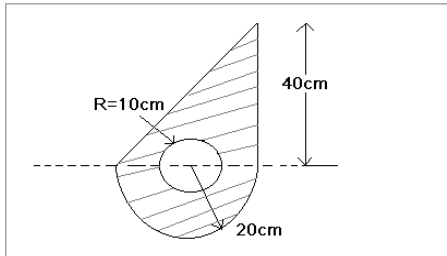

Figure:

   b)   Determine mass moment of inertia of slender rod of length ' L' about its centroidal axis normal to the rod.   [7M]

(OR)

8   a)   Determine the mass moment of inertia of a thin equilateral triangular plate of mass 'm' and thickness 't' about the axis perpendicular to the plane of the plate and passing through the mass center. Base width= 'b' and height of vertex above base= 'h'. Density of material is 'w'.   [10M]

   b)   Explain polar moment of inertia and product of inertia.   [4M]

UNIT-V

9   a)   A body moves along a straight line and its acceleration 'a' which varies with time 't' is given by a = 2-3t. Five seconds after the start of observation, the velocity is 20 m/s. The distance moved by the body 10 sec after the start of observation of motion from origin is 85 m. Determine i) the acceleration, velocity and distance from the origin at the start of observation. ii) the time after the start of observation at which the velocity becomes zero and the distance travelled from the origin.   [7M]

   b)   Explain D'Alembert's principle and principle of conservation of energy.   [7M]

(OR)

10   a)   In what distance will body A of figure attain a velocity of 3 m/s starting from rest? Use work-energy method to solve the problem.   [7M]
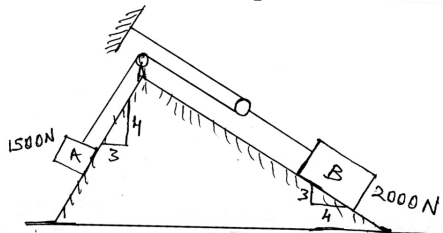

Figure:

   b)   A car is uniformly accelerated and passes successive kilometre-stones with velocities of 20 km/hour and 30 km/hour respectively. Calculate its velocity when it passes the next kilometre stone and the time taken for each of these two intervals of one kilometre.   [7M]

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