GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

BD17001018

Registration No:

Total Number of Pages : 06 **B.TECH**

AR-17

B.TECH 1ST SEMESTER EXAMINATIONS(BACK), NOV/DEC 2019

BBSES1031- BASICS OF MECHANICS

Time: 3 Hours **Max Marks : 100**

The figures in the right hand margin indicate marks.

PART-A

(10X1 = 10 MARKS)

Answer all questions.

a) A body is said to be in equilibrium, if it has --------- motion.

b) If a body is in ----------. We may conclude that the resultant and moment of forces about any point is zero.

c) If the resultant of two forces has the same magnitude as either of the force, then the angle between the two forces is -------

d) A body will begin to move down an inclined plane if the angle of inclination of the plane is _____ the angle of friction.

e) The maximum frictional force, which comes into play, when a body just begins to slide over the surface of the other body, is known as ---------

f) The point, through which the whole weight of the body acts, irrespective of its position, is known as ----------

g) Moment of inertia of a triangular section of base (b) and height (h) about an axis passing through its C.G. and parallel to the base, is ----------

h) Coefficient of friction is the ratio of the limiting friction to the ---------- between the two bodies.

i) The unit of angular acceleration is --------

j) A rubber ball is dropped from a height of 2 m. If there is no loss of velocity after rebounding, the ball will rise to a height of ---------

PART-B (15 x 2 = 30 MARKS)

Answer any fifteen questions from the following.

1) Draw FBD of ball rest against a smooth wall and an inclined plane which making angle α with the vertical wall?
2) What is an equilibrant? Discuss with an example?
3) What is the effect of force and moment on a body?
4) State the theorem of varignon applied to two concurrent coplanar forces?
5) State the theorem of transmissibility?
6) Define a force and what are the characteristic of force?
7) Define Resultant force?
8) What are the assumptions in Truss?
9) Described with neat sketch types of loads?
10) Explain the terms: coefficient of friction, and cone of friction
11) What is statically determinant truss?
12) Define D'Alembert's principle
13) State and prove Perpendicular axis theorem
14) Distinguish between centre of gravity and centroid
15) Explain the terms moment of inertia and radius of gyration
16) A particle starting from rest from the origin moves in a straight line whose equation of motion is given by $v = 2t^3 - 3t^2$. What will be the displacement of the particle after 4 seconds?
17) Define the coefficient of restitution
18) What are the units of work done? What is the relation between work done and power?
19) Calculate the work done in pulling up a block of mass 200 kg for 10 m on a smooth plane inclined at an angle of 15° with the horizontal.
20) A body of mass 7.5 kg is moving with a velcoity of 1.2 m/s. If a force of 15 N is applied on the body, determine its velocity after 2 s.

PART-C (6 x 5 = 30 MARKS)

Section-i **Answer any Six questions**

1. A ball of weight W rests upon a smooth horizontal plane and has attached to its center two strings AB and AC which pass over frictionless pulleys at B and C and carry loads P and Q, respectively, as shown in Fig.1 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.

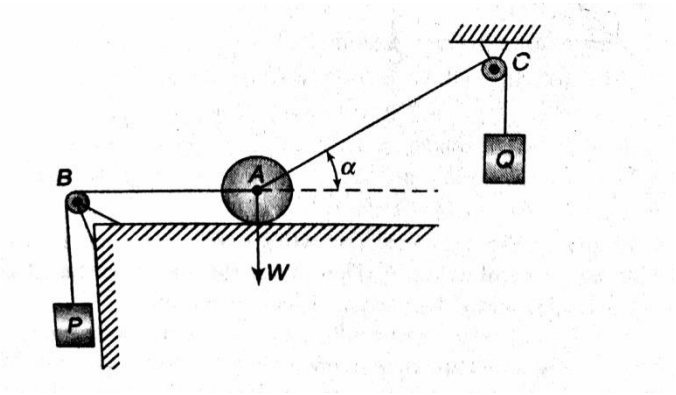

Figure 1

2. A bar AB hinged to the foundation at A and supported by strut CD is subjected to a horizontal 50 kN load at B, as shown in Fig.2 Find graphically the tensile force S in the strut and the reaction Ra at A.

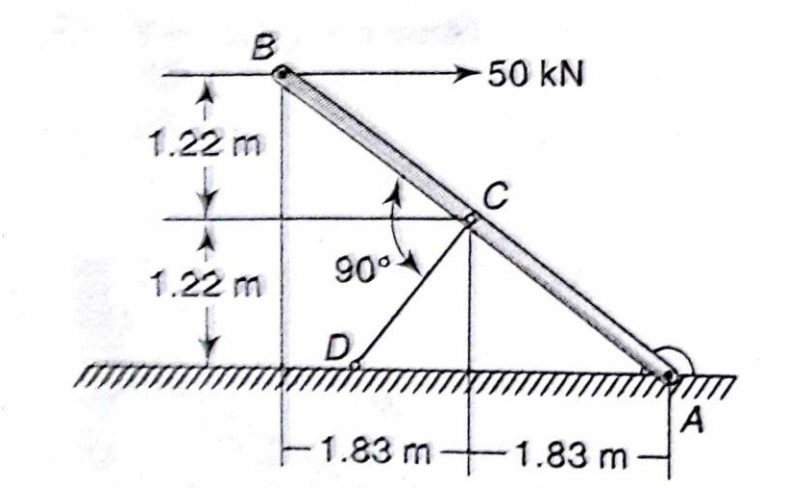

Figure 2

3. State and prove the Theorem of varignon.

4. Two blocks A and B of weights 1 kN and 2 kN respectively are in equilibrium position as shown in Fig. 3. If the coefficient of friction between the two blocks as well as the block B and the floor is 0.3, find the force (P) required to move the block B

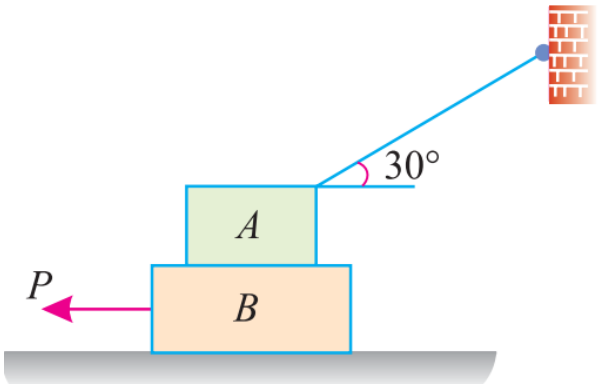

Figure 3

5. A uniform lamina shown in Fig. 4 consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm.

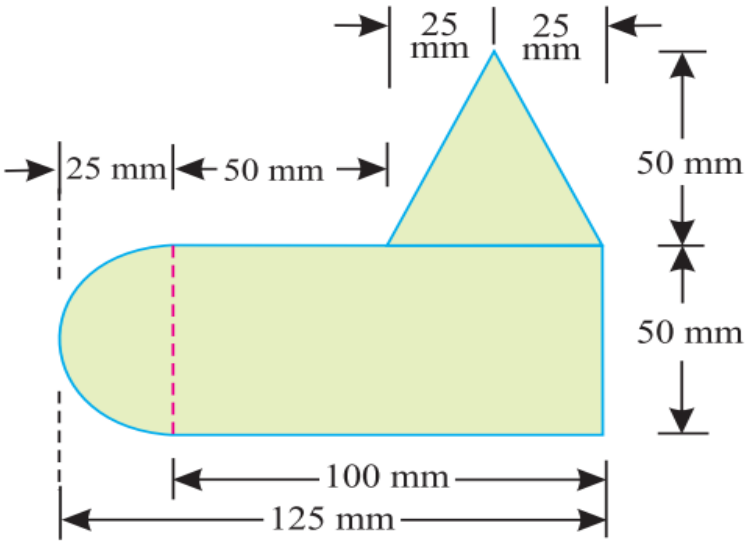

Figure 4

6. A truss shown in Fig 5 is carrying a point load of 5 KN at E. Find the forces in all the members the truss.

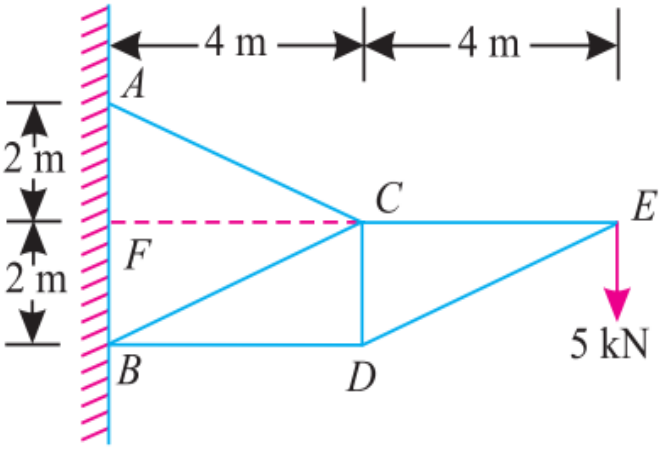

Figure 5

7. Prove that the differential change in K.E. of a moving particle is equal to the work done by the acting force.

8. Two blocks of weight P and Q are connected by a flexible but inextensible cord and supported as shown in figure.6 If the coefficient of friction between the block P and the horizontal surface is μ and all other friction is negligible, find (a) the acceleration of the system and (b)the tensile force S in the cord. The following numerical data are given: P=53.4N, Q=26.7N, μ=1/3.

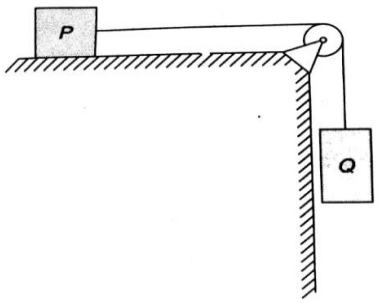

Figure 6

Section-ii **Answer any Two questions** **(2 x 15 = 30 MARKS)**

Q1. Find the moment of inertia of the lamina with a circular hole of 30 mm diameter about the axis *AB* as shown in Fig. 7

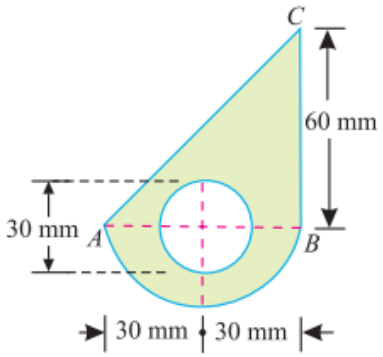

Figure 7

2. Determine the forces all the members of the truss shown in figure -8

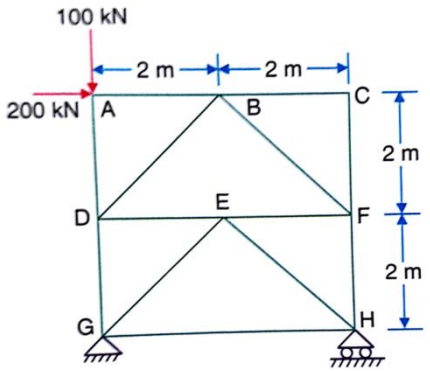

Figure 8

3. A smooth circular cylinder of weight Q and radius r is supported by two semicircular cylinders each of the same radius r and weight Q/2, as shown in Fig.9 If coefficient of static friction between the flat faces of the semicircular cylinders

and the horizontal plane on which they rest is $\mu = \frac{1}{2}$ and friction between the cylinders themselves is neglected, determine the maximum distance b between the centers B and C for which equilibrium will be possible without the middle cylinder touching the horizontal plane.

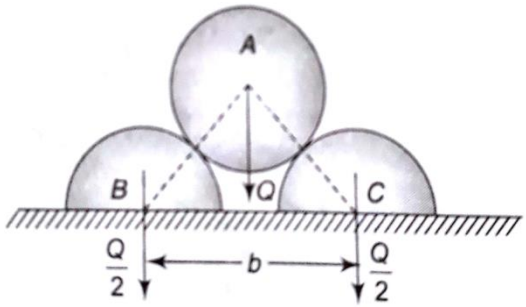

Figure 9

4. The block A and B under the action of gravity slide down the inclined plane CD that makes with the horizontal the angle [a]=30 degree in figure.11 If the weights of the blocks are Wa=44.5N and Wb=89N and the coefficients of friction between them and the inclined plane are μa=0.15 and μb=0.30,find the pressure P existing between the blocks during the motion

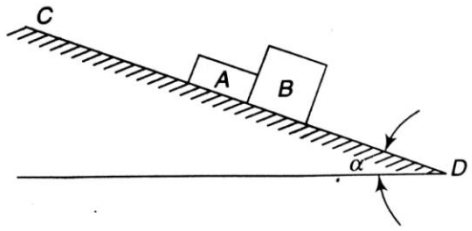

Figure 3

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