Registration No:

Total Number of Pages : 3   **B.TECH**

2nd Semester Regular Examination-April-May 2019
BBSES1031 Basics of Mechanics
(Regulations 2018) AEIE/BT/CHEM/CIVIL/ECE/EE/EEE/IT ENGG.

Time : 3 Hours   Maximum : 100 Marks

Answer ALL Questions
The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) 10 x 2=20 Mark

Q.1. Answer _All_ Questions.

a. Effect of a force on a body depends upon   [CO1] [PO1]
   a) magnitude b) direction c) position or line of action d) all the above

b. If a body is in equilibrium, we may conclude that   [CO1] [PO2]
   a) No force is acting on the body b) The resultant of all the forces acting on it is zero
   c) The moments of the forcesabout any point is zero, d)Both (b) and (c)

c. The resultant of two force P and Q acting at an angle θ is equal to   [CO1] [PO2]
   a) $\sqrt{P^2 + Q^2 + 2PQ\sin\theta}$ b) $\sqrt{P^2 + Q^2 + 2PQ\cos\theta}$ c) $\sqrt{P^2 + Q^2 - 2PQ\sin\theta}$
   b) $\sqrt{P^2 + Q^2 - 2PQ\cos\theta}$

d. The magnitude of the force of friction between two bodies, one lying above the other depends upon   [CO2] [PO1]
   the roughness of the
   a) Upper body b)Lower body c) Both the bodies d)The body having more roughness

e. The ratio of limiting friction and normal reaction is known as   [CO2] [PO2]
   a) coefficient of friction b) angle of friction c) angle of repose d) friction resistance

f. Pick up the incorrect statement from the following: [CO3] [PO2]
   a) The C.G. of a circle is at its center
   b) The C.G. of a triangle is at the intersection of its medians
   c) The C.G. of a rectangle is at the inter-section of its diagonals
   d) The C.G. of a semicircle is at a distance of r/2 from the center

g. The perpendicular axis theorem is used in obtaining the moment of inertia of a   [CO3] [PO2]
   a) Triangular lamina b)Square lamina c)Circular lamina d)Semicircular lamina

h. The measure of the body's resistance to angular acceleration is called _____   [CO3] [PO1]
   a) Mass moment of inertia of a body c)Volume moment of inertia of a body
   b) Line moment of inertia of a body   d)Gauss moment of inertia of a body

i. The potential energy of a mass (m) kg raised through a height (h) metres is   [CO4] [PO1]
   a) mh newtons b)gh newtons c) mgh newtons d)none of these

j. The torque acting on a body of moment of inertia (*I*) and angular acceleration (α) is   [CO4] [PO1]
   a) $I\alpha$ b) $I\alpha^2$ c) $0.5I\alpha$ d) $0.5I\alpha^2$

PART – B: (Short Answer Questions) 10 x 2 =20 Marks

Q.2. Answer _ALL_ questions

a. State the principle of transmissibility.   [CO1] [PO1]
b. State the polygon law of forces.   [CO1] [PO2]
c. What is the advantage of method of section over method of joints? How will you use method of   [CO2] [PO1]
   section in finding forces in the members of a truss?
d. What is the angle of repose?   [CO2] [PO2]
e. A block weighing 40 N is just moved along the horizontal plane by applying a horizontal force of 16   [CO2] [PO2]
   N. Find the coefficient of friction.
f. When will the cenroid and centre of mass coincide?   [CO3] [PO1]
g. State perpendicular axis theorem.   [CO3] [PO1]
h. Define polar moment of inertia of an area and state its application.   [CO3] [PO1]
i. A train running at 80 km/hr is brought to a standing halt in 50 seconds. Find its retardation.   [CO4] [PO2]
j. State the law of conservation of momentum.   [CO4] [PO1]

PART – C: (Long Answer Questions) 4 x 15 =60 Marks

Answer *ALL* questions

Q.3

a. A machine component 1.5 m long and weight 1000 N is supported by two ropes AB and CD as shown in Fig. given below. Calculate the tensions T_1 and T_2 in the ropes AB and CD.   7   **[CO1] [PO2]**
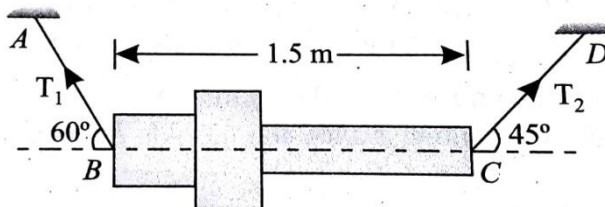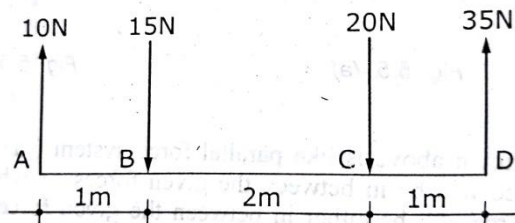

b. Determine the magnitude of force F and angle θ for the particle shown in Fig. to be in equilibrium.   8   **[CO1] [PO2]**
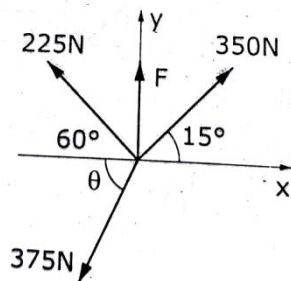

OR

c. State the Varignon's theorem with suitable expression.   5   **[CO1] [PO1]**

d. Four parallel forces of magnitudes 10 N, 15 N, 20 N and 35 N are shown in Fig. Determine the magnitude and direction of the resultant. Find the distance of the resultant from point A.   10   **[CO1] [PO2]**

Q.4

a. State the difference between a truss and a frame.   5   **[CO2] [PO1]**

b. A truss is loaded and supported as shown in Fig. find by the method of joints the axial forces in each member of the truss   10   **[CO2] [PO2]**
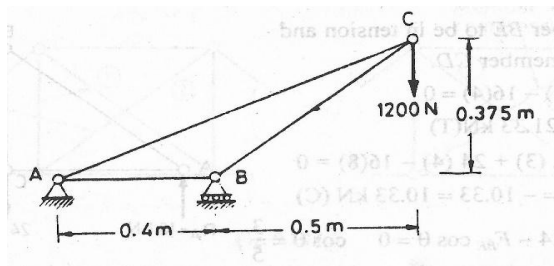

OR

c. State the laws of static and dynamic friction.   5   **[CO2] [PO1]**

A ladder 5m long rests on a horizontal ground and leans against a smooth vertical wall at an angle of 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle.   10   **[CO2] [PO2]**

d. The ladder is at the point of sliding when a man weighing 750 N stands on a rung 1.5 m from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor.

Q.5

a. Calculate the centre of gravity of hemisphere of 80 mm radius from its base measured along the vertical axis. 5 **[CO3] [PO1]**

b. Determine the centroid of the area shown in Fig. with respect to the axes shown. 10 **[CO3] [PO2]**
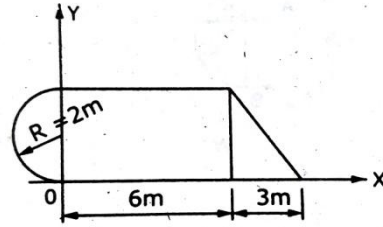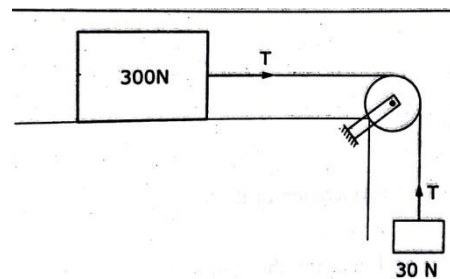

OR

c. Find the moment of inertia of a circular section of 50 mm diameter about an axis passing through its centre. 5 **[CO3] [PO2]**

d. Derive the expression for moment of inertia of a rectangular lamina about the base from the first principle. Also find the expression for moment of inertia about its centroidal axis by applying parallel axis theorem. 10 **[CO3] [PO2]**

Q.6

a. A stone is thrown vertically upwards with a velocity of 40 m/s. find its position after 5 seconds. 5 **[CO4] [PO2]**

b. A cage descends in a mine shaft with an acceleration of 0.5 m/s2. After the cage has travelled 25 m, a stone is dropped from the top of the shaft. Determine the (a) time taken by the stone to hit the cage, and (b) distance travelled by the cage before impact. 10 **[CO4] [PO2]**

OR

c. Define D'Alembert's principle with mathematical expression. 5 **[CO4] [PO1]**

d. Fig. shows a body of weight 300 N on a smooth horizontal plane is attached by a string to a 30 N weight, which hangs vertically. Find the acceleration of the system and the tension in the string. 10 **[CO4] [PO2]**

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