M18001036

Registration No: | | | | | | | | | | |

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

B.TECH 2ND SEMESTER REGULAR EXAMINATIONS, MAY 2018
BASICS OF MECHANICS
Subject Code:BBSES1031
Time: 3 Hours
Max Marks : 100

CO1 Determine the resultant force and moment for a given force system.
CO2 Analyze planar and spatial systems to determine the forces in members of trusses, frames and problems related to friction.
CO3 Calculate the centriod and moment of inertia of plane and composite figures.
CO4 Illustrate the motion parameters of a body subjected to Dynamic principles.

PART-A (10X1 = 10 MARKS)

Answer *All* Questions.

a. If a body is in equilibrium. We may conclude that [CO1]
(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 forces about any point is zero.
(d) Both (b) and (c)

b. Which of the following statements is false about forces/couple? [CO1]
a. Moment of couple is free vector
b. Resultant and equilibrant are equal in magnitude and direction
c. Resultant of a couple is always zero
d. Parallelogram law is to be proved experimentally

c. Which of the following is the basic of mechanics? [CO1]
a. Charge b. Energy c. Force d. Power

d. If the sum of all the forces acting on a body is zero, then the body may be in equilibrium provided the forces are _____. [CO1]
(a) Concurrent (b) Parallel (c) Like parallel (d) Unlike parallel

e. A couple consists of _____ . [CO1]
(a) two like parallel forces of same magnitude.
(b) two like parallel forces of different magnitudes.
(c) two unlike parallel forces of same magnitude.
(d) two unlike parallel forces of different magnitudes.

f. 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 _____. [CO2]
a. static friction
b. dynamic friction
c. limiting friction
d. coefficient of friction

g. The friction experienced by a body, when in motion, is known as_____. [CO2]
a. rolling friction
b. dynamic friction
c. limiting friction

d. static friction

h. 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 _____. [CO3]

a) $(bh^3)/4$ b) $(bh^3)/8$ c) $(bh^3)/12$ d) $(bh^3)/36$

i. Which of the following is an equation of linear motion?(where, u and v = Initial and final velocity of the body, a = Acceleration of the body, and s = Displacement of the body in time t seconds.) [CO4]

a. $v = u + a.t$

b. $s = u.t + (1/2) \times a.t^2$

c. $v^2 = u^2 + 2a.s$

d. all of these

j. The coefficient of restitution of perfect elastic body is _____ . [CO4]

a. 0

b. 1

c. 0.5

d. Non of these

PART-B (15 x 2 = 30 MARKS)

Answer any fifteen questions from the following.

1. What is an equilibrant? Discuss with an example? [CO1]
2. What is the effect of force and moment on a body? [CO1]
3. State the theorem of varignon? [CO1]
4. State the theorem of transmissibility ? [CO1]
5. What are the assumptions made in the analysis of the Truss? [CO2]
6. How method of joint differs from the method of section. [CO2]
7. Define angle of repose and prove that it is equal to angle of friction in magnitude. [CO2]
8. What is sliding friction and rolling friction? [CO2]
9. State the laws of dry friction? [CO2]
10. What is plane truss and space truss? [CO2]
11. Distinguish between centre of gravity and centroid. [CO3]
12. Explain the terms moment of inertia. [CO3]
13. Define the term of Impact and period of collision. [CO4]
14. State the principle of Impulse-momentum. [CO4]
15. Explain the term conservation of momentum. [CO4]
16. Define the coefficient of restitution . [CO4]
17. Write the relation between displacement, velocity and acceleration? [CO4]
18. What are the units of work done? What is the relation between work done and power? [CO4]
19. A horse pulling a cart exerts a steady horizontal pull of 300 N and walks at the rate of 4·5 km.p.h. How much work is done by the horse in 5 minutes? [CO4]
20. A rubber ball is dropped from a height of 2 m. If there is no loss of velocity after rebounding, what height the ball will rise? [CO4]

PART-C

(6 x 5 = 30 MARKS)

Section-i **Answer any Six questions**

1. Two smooth spheres of weight W and radius r each are in equilibrium in a horizontal channel of A and B vertical sides as shown in Fig. 1. Find the force exerted by each sphere on the other. Calculate these values, if r = 250 mm, b = 900 mm and W = 100 N. [CO1]

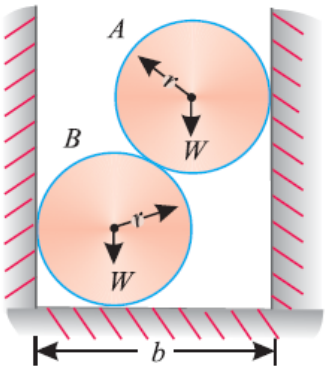

Figure 1

2. A simply supported beam AB of 6 m span is subjected to loading as shown in Fig. 2 Find the support reactions at A and B. [CO1]

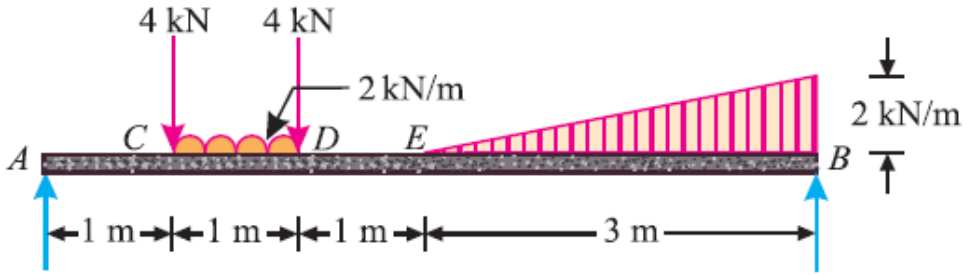

Figure 2

3. A prismatic bar AB of wt. Q=17.8 KN is hinged to a vertical wall at A and supported at B by cable BC as shown in Fig.3. Determine the magnitude and direction of the reaction at hinge A and tensile force in cable BC. [CO1]

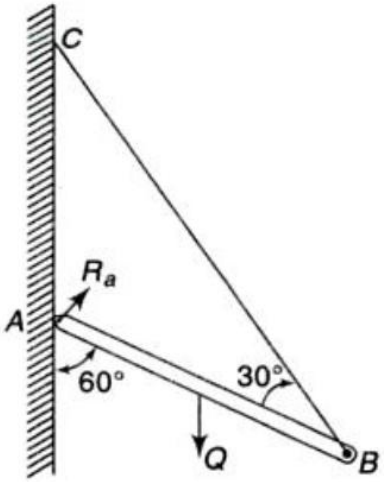

Figure 3.

4. The following forces act at a point: [CO1]

(i) 20 N inclined at 30° towards North of East.
(ii) 25 N towards North.
(iii) 30 N towards North West and
(iv) 35 N inclined at 40° towards South of West.

Find the magnitude and direction of the resultant force

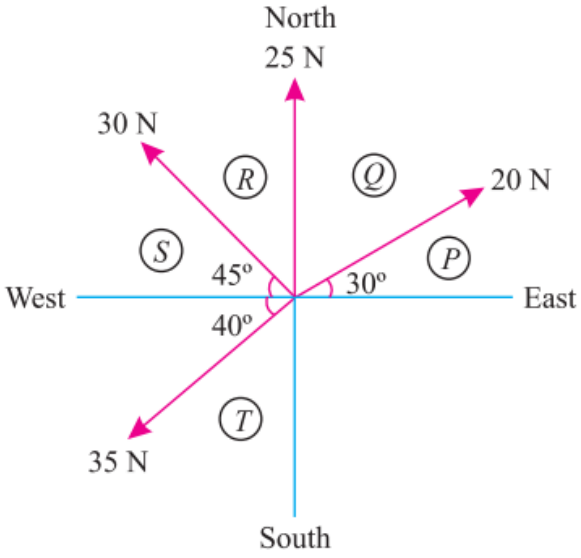

Figure 4

5. A uniform ladder of 4 m length rests against a vertical wall with which it makes an angle of 45°. The coefficient of friction between the ladder and the wall is 0.4 and that between ladder and the floor is 0.5. If a man, whose weight is one-half of that of the ladder, ascends it, how high will it be when the ladder slips? [CO2]

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6. Find the centre of gravity of a channel section 100 mm × 50 mm × 15 mm as given below in Fig. 5. [CO3]

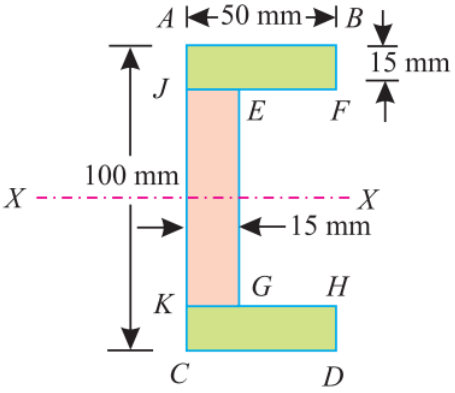

Figure 1

7. The equation of motion of a particle moving in a straight line is given by: s = 18t + 3t2 – 2t3 where (s) is in metres and (t) in seconds. Find (1) velocity and acceleration at start, (2) time, when the particle reaches its maximum velocity, and (3) maximum velocity of the particle. [CO4]

8. A ball of mass 1 kg moving with a velocity of 2 m/s impinges directly on a ball of mass 2 kg at the second ball after the impact and the coefficient of restitution rest. The first ball, after impinging, comes to rest. Find the velocity of the second ball after the impact and the coefficient of restitution. [CO4]

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

1. **a.** the smooth cylinders rest in a horizontal channel having vertical walls, the distance between which as a (Fig.6) find the pressures exerted on the walls and floor at the points of contact A,B,C and F. the following numerical data are given : P=200N, Q=400 N,R = 300 N, r_1=120 mm, r_2=180 mm, r_3=150 mm and a =540 mm.? **[10] [CO1]**

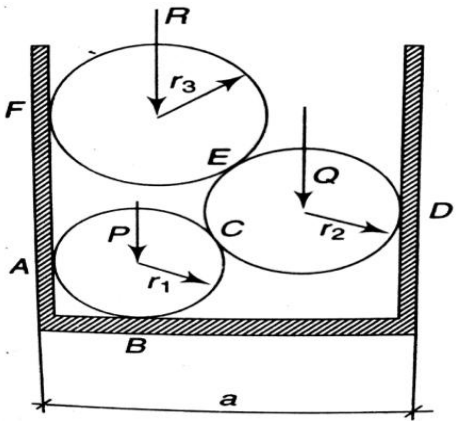

Figure 6

b. State and proof law of parallelogram of forces? **[5] [CO1]**

2. **a.** A truss shown in Fig 7 is carrying a point load of 5 KN at E. Find the forces in all the members the truss? **[8] [CO2]**

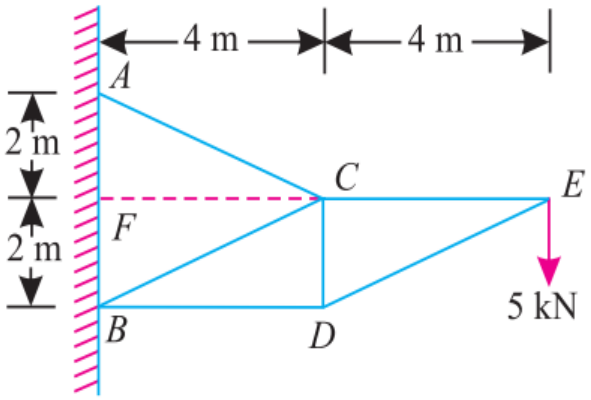

Figure 7

b. Two blocks A and B of weights 1 kN and 2 kN respectively are in equilibrium position as shown in Fig. 8. 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 moving the block B. [7] [CO2]

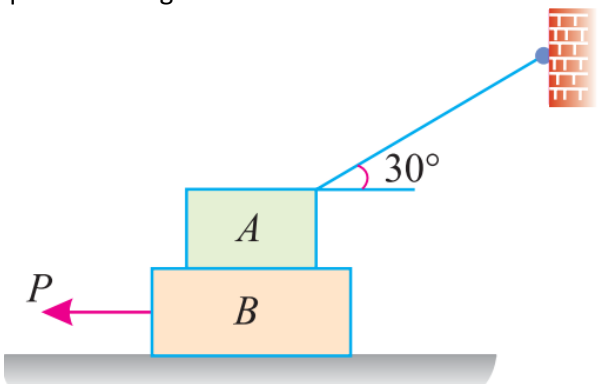

Figure 8

3. a. Find the moment of inertia of the lamina with a circular hole of 30 mm diameter about the axis *AB* as shown in Fig. 9. [10] [CO3]

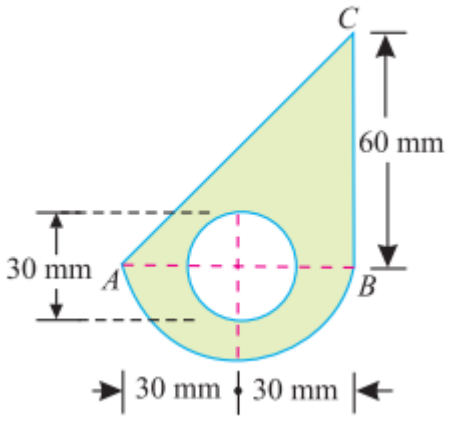

Figure 9

b. state and proof pappus first and second theorem **[5] [CO3]**

4. a. Two blocks of weight P and Q are connected by a flexible but inextensible cord and supported as shown in Figure 10. If the coefficient of friction between the block P and the horizontal surface is μ and all other friction is negligible, the following numerical data are given: P=200 kg, Q=300 kg, μ= 0.25. Determine the velocity of block P after it moved 2m. **[10] [CO4]**

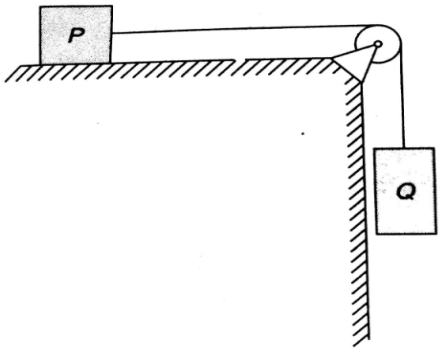

Figure 10

b. Prove that the differential change in K.E. of a moving particle is equal to the work done by the acting force.? **[5] [CO4]**

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