GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

BD18001018

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

Total Number of Pages : 4 AR-18 B.TECH

1st Semester (BACK PAPER) Examination-December 2019

BBSES1031 Basics of Mechanics

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 The S.I unit of Moment is
(a) N (b) N. meter (c) Kg. met. /s^2 (d) none of these

b If a body is in equilibrium. We may conclude that
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)

c The force of friction developed between two surfaces in contact is independent of
(a) Roughness of surface (b) Area of contact between the surfaces
(c) Reaction of surface (d) Force which tends to cause the motion

d Angle of friction is the
(a) Angle between normal reaction and the resultant of normal reaction and the limiting friction
(b) Ratio of limiting friction and normal reaction
(c) The ratio of minimum friction force to the friction force acting when the body is just about to move
(d) The ratio of minimum friction force to friction force acting when the body is in motion

e The centre of mass is a point where the _____ of the body is concentrated.

a) mass b)area c)volume d) Weight

f 5. The units of moment of inertia of an area are
(a) kg m2 (b) m4 (c) kg/m2 (d) kg/m4.

g *8.* The polar moment of inertia is _____ of Ixx and Iyy .

(a) Sum (b) Product (d) Different (d) None of these

h 3.Which of the following is not the unit of energy
(a) kg m (b) kcal (c) watt (d) watt hours

i 7. The total momentum of two bodies remains constant after collision or any other mutual action. This is known as
(*a*) Law of Conservation of Momentum (*b*) Newton's Law of Collision of Elastic Bodies
(*c*) Both (*a*) and (*b*) (*d*) None of them

j 10. The loss of kinetic energy due to direct impact of two bodies depends on
(*a*) The mass of two bodies (*b*) The initial velocities of two bodies
(*c*) The final velocities of two bodies (d) Both (a) and (b

PART – B: (Short Answer Questions) 10X2=20 Marks

Q.2. Answer *ALL* questions

a Define the law of transmissibility.
b State the theorem of superposition.
c State Lami's theorm.
d State the assumptions required to solve a truss problem?
e What are the advantages of method of section over method of joint?
f Define Pappus theorem-1.
g Write down the mathematical formula to find out the centroid of a composite figure.
h State perpendicular axis theorem.
i Define impact and elastic impact.
j Differentiate between plastic impact, elastic impact and semi elastic impact.

PART – C: (Long Answer Questions) 4X15=60 Marks

Answer *ALL* questions

Q.3

a A bar AB hinged to the foundation at A and supported by a strut CD is subjected to a horizontal 50 kN load at B, as shown in figure.2 Find the tensile force in the strut and the reaction force at A. 10

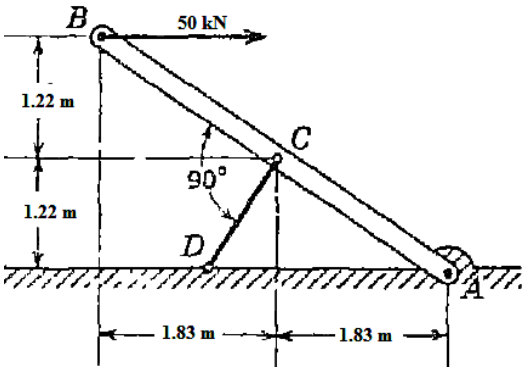

Fig. 2

b The following forces act at a point: 5

(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.

OR

c I. State and prove Varignon's Theorem. 10

II. State and prove parallelogram law of forces. .

d A smooth circular cylinder of radius 1.5 meter is lying in a triangular groove, as shown in fig.4 one side of which makes 15° angle and the other 40° angle with the horizontal. Find the reactions at the surfaces of contact, if there is no friction and the cylinder weights 100 N. 5

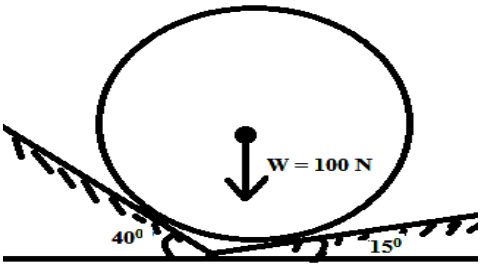

Fig. 4

Q.4

a Determine the axial force in each bar of the plane truss loaded as shown in figure.7 5

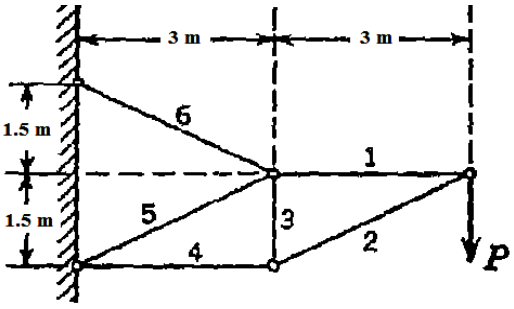

Fig. 7

b A block of weight W = 890 N rests on a horizontal surfaces and supports on top of it another block of weight W2 = 222.5 N. The block W2 is attached to a vertical wall by the inclined string AB . Find the magnitude of the horizontal force P, applied to the lower block as shown in Fig.8 that will be necessary to cause slipping to impend. The coefficient of static friction for all contiguous surfaces is μ = 0.3. 10

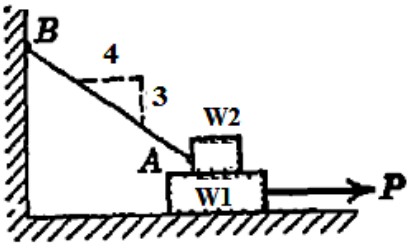

Fig. 8

OR

c (a) Two blocks of weights W_1 and W_2 rest on a rough inclined plane and are connected by short piece of string as shown in Fig. 9 if the coefficients of friction are $\mu_1 = 0.2$ and $\mu_2 = 0.3$, respectively find the angle of inclination of the plane for which siding will impend. Assume $W_1=W_2 = 51N$. 7

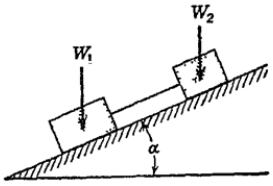

Fig.9

d Referring to Fig.10 find the axial force in the bar x: using the method of sections. ABC is equilateral. 8

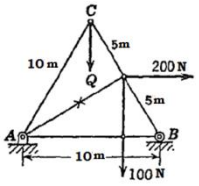

Fig.10

Q.5

a Find the centroid of a quatercircular area of radius ‘r’. 5

b With reference to the coordinate axes x and y, locate the centroid of the shaded area of the plane figure shown in fig 14. 10

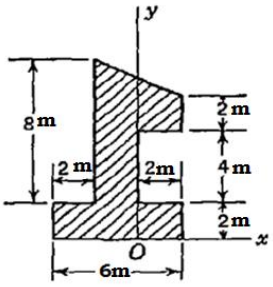

Fig.14

OR

c Locate the centroid C of the shaded area O ABD shown in Fig. 19 7

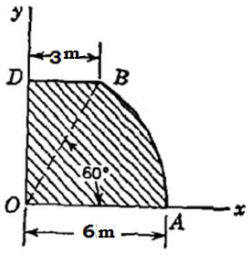

Fig.19

d A uniform lamina shown in Fig. 20 consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm. 8

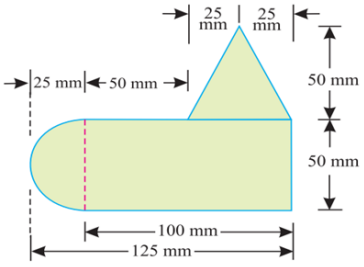

Fig.20

Q.6

a Two blocks of weight P and Q are connected by a flexible but inextensible cord and supported as shown in Figure. 22. 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 7

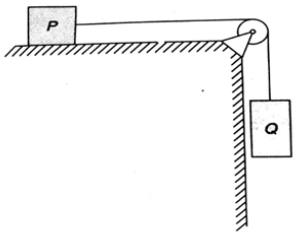

Fig.22

b A wood block weighing 44.3 N rests on a rough horizontal plane, the coefficient of friction between the two being μ =0.4. if a bullet weighing 0.23 N is fired horizontally into the block with muzzle velocity v=600 m/s, how far will the block be displaced from its initial position? Assume that the bullet remains inside the block. 8

OR

c Two blocks A and B under the action of gravity slide down the inclined plane CD that makes with the horizontal the angel α =30^0 (Fig. 25). if the weights of the blocks are W_a=44.5 N and W_b=89 N and the coefficients of fiction between them and the inclined plane are $\mu_a = 0.15$ and $\mu_b = 0.30$, find the pressure P existing between the blocks during the motion. 7

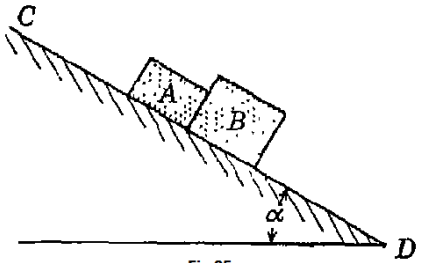

Fig.25

d A small block of weight W rests on an adjustable inclined plane as shown in Fig. 26 Friction is such that sliding of the block impends when α =30^0. What acceleration will the block have when α 45^0? Neglect any difference between static and kinetic friction. 8

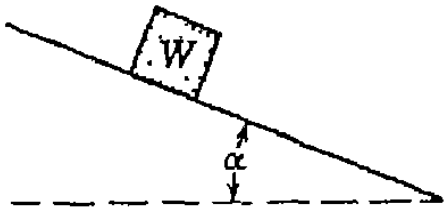

Fig.26

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