GIET MAIN CAMPUS AUTONOMOUS,
GUNUPUR - 765022

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

Total Number of Pages : 4

B.TECH. DEGREE EXAMINATION-Nov-Dec.2018
End Semester Examination-I Semester
BBSBS 1032-Basics of Mechanics
(Regulations 2018)(Common to CSE,MECH, Branches)
(Regulations 2017)(Common to BIOTECH,CHEMIAL,CIVIL,EE,EEE & MECH Branches)

Time : 3 Hours Maximum : 100 Marks Question Code:31312

Answer ALL Questions

PART-A (10 X 2=20 Marks)

1. a) A number of forces acting at a point will be in equilibrium if [CO1, PO1]
   (a) Their total sum is zero
   (b) Two resolved parts in two directions at right angles are equal
   (c) Sum of resolved parts in any two perpendicular directions are both zero
   (d) All of them are inclined equally
   (e) None of the above

   b) 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, PO1]
   (a) Concurrent (b) Parallel (c) Like parallel (d) Unlike parallel

   c) The moment of a force about any point is geometrically equal to... area of the triangle whose base is the line representing the force and vertex is the point about which the moment is taken. [CO1, PO1]
   (a) Half (b) Same (c) Twice (d) None of these

   d) No of members in a Redundant truss is [CO2,PO1]
   (a) <2n-3 (b) n – l (c)> 2n – 3 (d) 3n - 2 .
   Where n = number of joints in a frame

   e) The coefficient of friction depends on [CO2,PO1]
   (a) Area of contact (b) Shape of surfaces
   (c) Strength of surfaces (d) Nature of surface

   f) On a ladder resting on smooth ground and leaning against vertical wall, the force of friction will be [CO2,PO1]
   a) Towards the wall at its upper end b) Away from the wall at its upper end
   c) Upwards at its upper end d) Downwards at its upper end

   g) The moment of inertia of a triangular section of base (b) and height (h) about an axis passing through its vertex and parallel to the base is ... as that passing through its C.G.and parallel to the base. [CO3, PO2]
   (a) twelve times (b) nine times (c) six times (d) four times

   h) A quarter circle plane area has its centroid from its base at _____ [CO3, PO1]
   (a) $4R/3\pi$ (b) $2R/3\pi$ (c) $3\pi/4R$ (d) None of these

   i) D' Alembert's principle is used for [CO4,PO1]
   (a) Reducing the problem of kinetics to equivalent statics problem
   (b) Determining stresses in the truss
   (c) Stability of floating bodies
   (d) Designing safe structures

   j) The total momentum of two bodies remains constant after collision or any other mutual action. This is known as [CO4, PO1]
   (*a*) Law of Conservation of Momentum
   (*b*) Newton's Law of Collision of Elastic Bodies
   (*c*) Both (*a*) and (*b*)
   (*d*) None of them

PART-B (10 X 2=20 Marks)

2. a) State Lami's theorm. [CO1,PO1]
   b) What is an equilibrant? Discuss with an example? [CO1,PO1]
   c) What is statically determinant truss? [CO2,PO1]

d) State the laws of friction. [CO2,PO1]
e) Write relationship between angle of friction and coefficient of friction? [CO2,PO1]
f) Define polar moment of inertia [CO3,PO1]
g) Define Pappus theorem-1. [CO3,PO1]
h) Find the moment of inertia of a rectangular section 30 mm wide and 40 mm deep about X-X axis and Y-Y axis? [CO3,PO2]
i) Distinguish between kinetics and kinematics. [CO4, PO1]
j) A body of mass 7.5 kg is moving with a velocity of 1.2 m/s. If a force of 15 N is applied on the body, determine its velocity after 2 s. [CO4, PO2]

PART-C (4 X 15=60 Marks)

3a. (i) The following forces act at a point: [5] [CO1, PO2]

(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.

(ii)Three cylinders weighting 100 N each and of 80 mm diameter are placed in a channel of 180 mm width as shown in figure.1 Determine the force exerted by (i) the cylinder A on B at the point of contact (ii) the cylinder B on the base and (iii) the cylinder B on the wall. [10] [CO1, PO2]

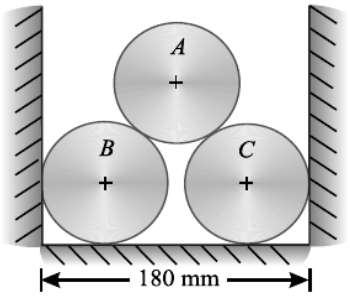

Fig-1

(or)

b. (i). State and prove Varignon's Theorem and State and prove parallelogram law of forces. . [7] [CO1, PO1]

(ii) Determine the axial forces $S_1$and S_2 induced in the bars AC and BC in Fig. 2 due to the action of the horizontal applied load at C. the bars are hinged together at C and to the foundation at A and B . [8] [CO1, PO2]

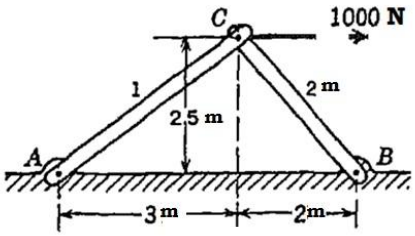

Fig-2

4.a (i). Determine the axial force in each bar of the plane truss loaded as shown in figure.3 [5] [CO2, PO2]

(ii)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.4 that will be necessary to cause slipping to impend. The coefficient of static friction for all contiguous surfaces is μ = 0.3. [10] [CO2, PO2]

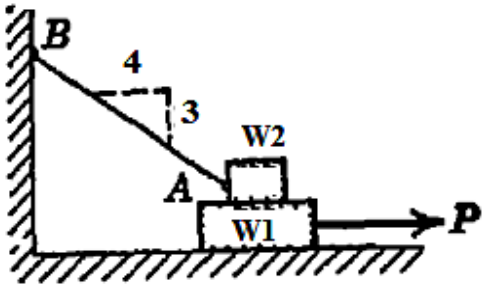

Fig-4

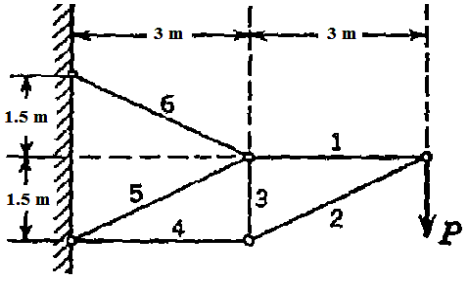

Fig-3

(or)

b. (i) 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. 5 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] [CO2, PO2]

(ii)Referring to Fig.6 find the axial force in the bar x: using the method of sections. ABC is equilateral. [8] [CO2, PO2]

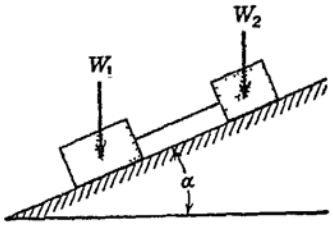

Fig-5

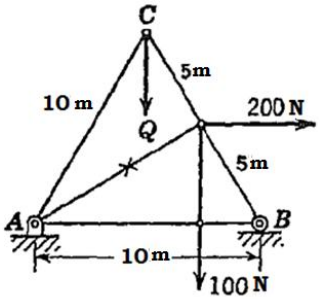

Fig-6

5a. (i) Find the centroid of a quatercircular area of radius 'r'. [5] [CO3,PO1]

(ii) Find the moment of inertia about the centroidal X-X and Y-Y axes of the angle section shown in figure.7 [10] [CO3, PO2]

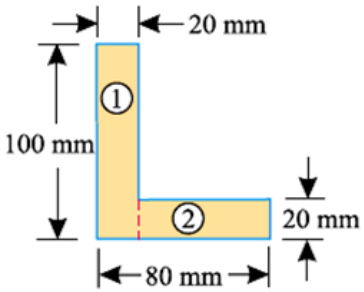

Fig-7

(or)

b (i) A uniform lamina shown in Fig.8 consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm. [10] [CO3,PO2]

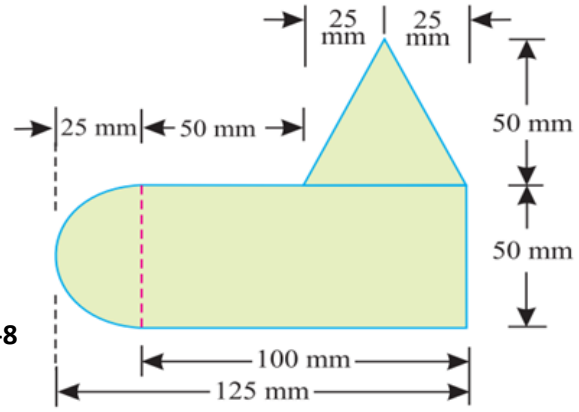

Fig-8

[5][CO3,PO2]

(ii) Find the polar moment of interia of a square with sides of length 'a' with respect to its centroid C. .

6a. (i) The equation of motion of a particle moving in a straight line is given by: $s=18t+3t^2-2t^3$ 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. [7] [CO4,PO2]

(ii) If the system in Figure.9 released from rest in the configuration shown, find the velocity v of the block Q after it falls a distance h=3m. Neglect friction and inertia of the pulleys and assume that P=Q=44.5N. [8] [CO4,PO2]

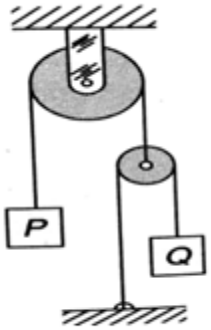

Fig-9

(or)

b (i) Differentiate between plastic impact, elastic impact and semi elastic impact. [5] [CO4, PO1]

(ii) Two blocks A and B under the action of gravity slide down the inclined plane CD that makes with the horizontal the angel $\alpha=30^0$ (Fig. 10). 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. [10] [CO4, PO2]

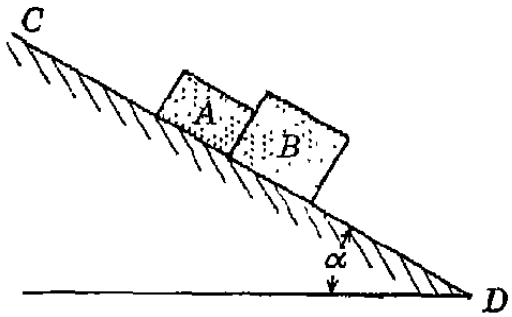

Fig-10

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