BTS(C) – I – 06 –005 (B)

B. Tech Degree I & II Semester (Combined) Examination June 2006

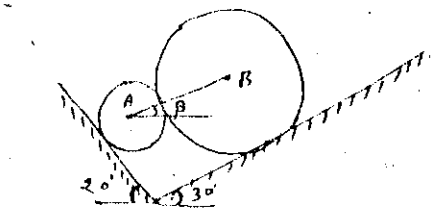
IT/CS/EC/CE/ME/SE/EB/EI/EE/MRE 105 ENGINEERING MECHANICS

(2000 Admissions onwards)

Time : 3 Hours Maximum Marks : 100

I. (a) State and prove theorem of Varignon. (7)

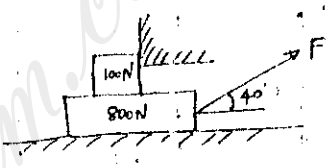
(b) Neglecting friction, find the angle β of line AB with horizontal for equilibrium and if $W_1 = 100N$, $W_2 = 200N$. (10)



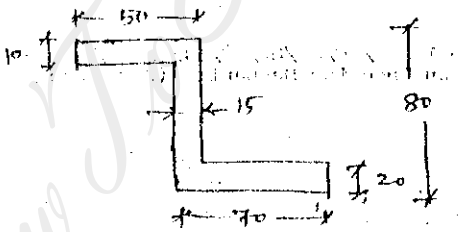
OR

II. (a) State the laws of coulomb friction. (5)

(b) What force F is needed to get the 800N block moving to the right? The coefficient of friction for all contact surface is 0.25. (12)

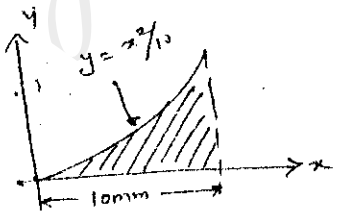


III. Determine the centroid of the section in the figure given below. Also determine I_x & I_y for the axes passing through centroid. (17)

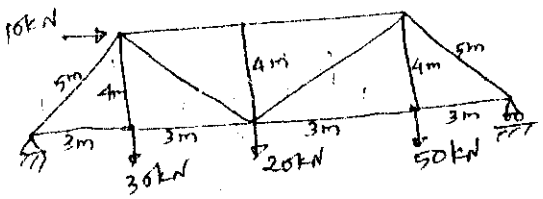


OR

IV. Locate the centroid of the shaded area shown in the figure. Also determine I_x, I_y, I_{xy}. (17)



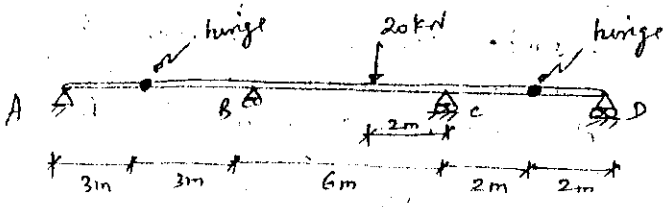
V. Determine the axial force in all the members of the truss shown in the figure. (16)



(Turn Over)

VI. (a) Explain the principle of virtual work. (4)

(b) Find the reaction at A,B,C and D for the beam shown in the figure using principle of virtual work (12)



VII. A body of mass 4kg drops freely from a height of 50m and penetrates into the ground by one metre. Find the average resistance of penetration and the time of penetration. (16)

OR

VIII. The acceleration of a particle moving in a straight line is directed towards a fixed point 0 and is inversely proportional to the distance of the particle from 0. At time $t = 0$, the displacement is 0.4m, velocity is 1.4m/s and the acceleration is $0.8 m/s^2$. Find the velocity when the displacement is 0.9m and the displacement when the velocity is zero. (16)

IX. A rotor of an electric motor is uniformly accelerated to a speed of 1800rpm from rest for 5 seconds and then immediately power is switched off and the rotor decelerate uniformly. If the total time elapsed from to stop is 12.5sec, determine the number of revolutions made in (i) acceleration (ii) deceleration. Also determine the value of deceleration. (17)

OR

X. (a) A gun of mass 3000kg fires horizontally a shell of mass 50kg with a velocity of 300m/s. What is the velocity with which the gun will recoil? Also determine the uniform force required to stop the gun in 0.6m. In how much time it will stop? (9)

(b) A particle is performing a S.H.M. When it is at distances of 10.0cm and 20.0cm from the mean position its velocities are 1.2m/s and 0.8m/s respectively.
Find (i) amplitude (ii) time period
(iii) its maximum velocity and (iv) its maximum acceleration. (8)

XI. A cylinder of mass 'M' and radius 'r' resting on an inclined plane is released from rest and rolls down the inclined plane without slipping. Determine
(i) the acceleration of its center of mass
(ii) the maximum angle θ of the inclined plane for which the body will roll without slipping
(iii) the maximum velocity of the center of the cylinder afterit has rolled a distance of 1m. Assume the coefficient of static friction $\mu = 0.192$ (17)

OR

XII. (a) Derive the expression for the period of small oscillation of a compound pendulum. (5)

(b) Determine the period of small oscillation of the Compound pendulum shown in the figure consisting of a disk of diameter 25.4cm and weight 13.5 or suspended by a slender bar of weight 2.25N and length 30cm. (12)

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