BT IN – II - 07 – 017

B. Tech Degree II Semester Examination in Instrumentation, May 2007

IN 204 ENGINEERING MECHANICS

(New Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

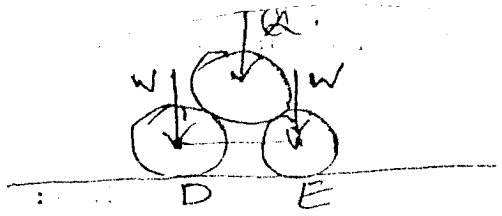
(Answer ***ANY FIVE*** questions)
(All questions carry ***EQUAL*** marks) (5 x 5 = 25)

I. (a) State any explain Parallelogram Law of forces.
(b) State and prove Varigion's theorem of moments.
(c) Define different Newton's Laws of motion
(d) Explain Hook's Law of isotropic materials.
(e) Explain Mohr's circle for plane stresses.
(f) What is meant by statically indeterminate beams?
(g) Explain the principle of pure bending.

PART B

(Answer ***ALL*** questions) (5 x 15 = 75)

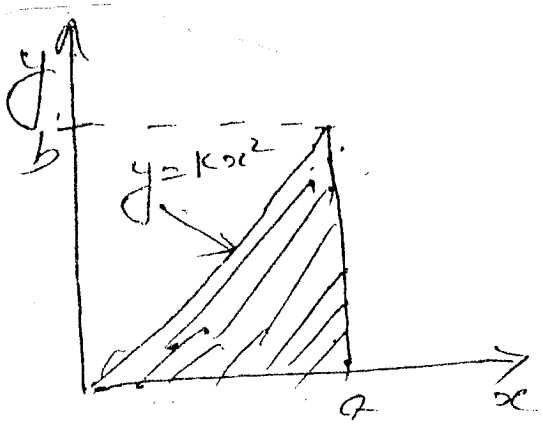
II. (a) Two smooth circular cylinders each of weight, w =150N and radius r = 7cm are connected at their centers by a string of length l = 18cm and rest up on a horizontal plane supporting above them a third cylinder of weight Q = 300N and radius r = 7cm. Find the force in the string and the support reactions. (9)



(b) A man of weight of w = 80kg holds one end of a rope that passes over a pulley vertically above his head and to the other end of which is attached a weight Q = 60kg. Find the force with which the man's feet press against the floor. (6)

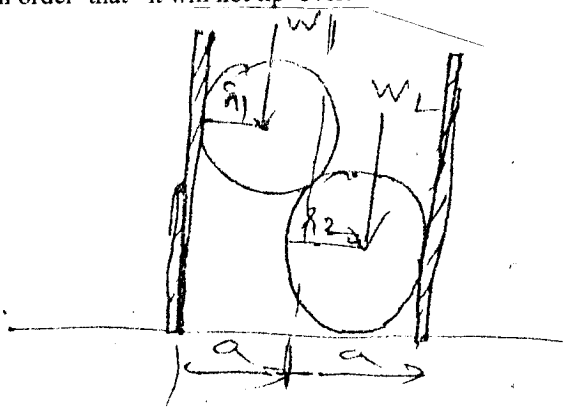
OR

III. Calculate the moment of inertia of the shaded region with respect to the x and y axis. (15)



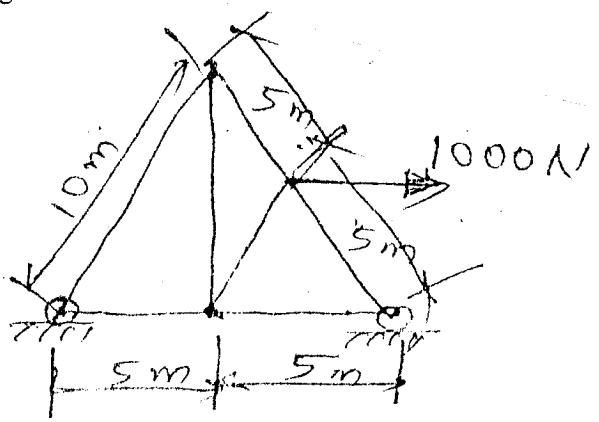
(Turn Over)

IV. A hollow light circular cylinder of radius a is open at both ends and rest on a smooth horizontal plane as shown in the figure below. Inside the cylinder are two spheres having weights w_1 and w_2 and radii r_1 and r_2 respectively. The lower sphere also rests on a the horizontal plane. Neglecting the friction find the minimum weight Q of the cylinder in order that it will not tip over. (15)



OR

V. Referring to the figure find the axial force in the bars of the truss loaded and supported as shown below. (15)



VI. (a) A ball is thrown vertically upward from a point on a tower located 25 m above the ground. Knowing that the ball strikes the ground 3 seconds after the release. Determine the speed with which the ball

(a) was thrown upward

(b) strike the ground. (6)

(b) A small block of weight w = 50N is given an initial velocity 3 m/s down a 30^0 inclined plane. If the coefficient of friction between the plane and block is 0.3 find the velocity of the block after it has travelled a distance of 15m. (9)

OR

VII. The rotor of an electric motor has an angular velocity 3600 rpm when the load and power are cut off. The 50kg rotor which has a centroidal radius of gyration of 180mm then coasts to rest. Knowing that the Kinetic friction of the rotor produces a couple of moment 3.5Nm. Determine the number of revolutions that the eccentrics before coming to rest. (15)

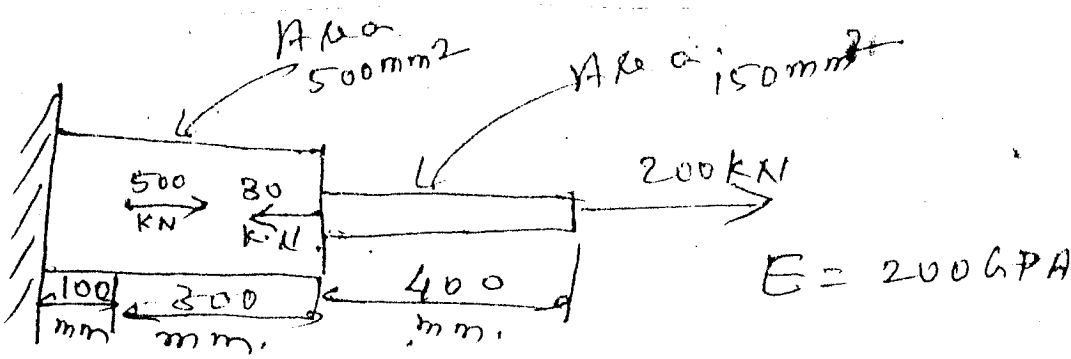
OR

VIII. (a) A prismatic bar of circular cross section is loaded by a tensile force p = 85KN. The bar has length L = 3m and diameter 30mm. It is made of aluminum with modulus of elasticity E = 70Gpa and poission's ratio r = 1/3. Calculate the Elongation, & the

(Contd...3)

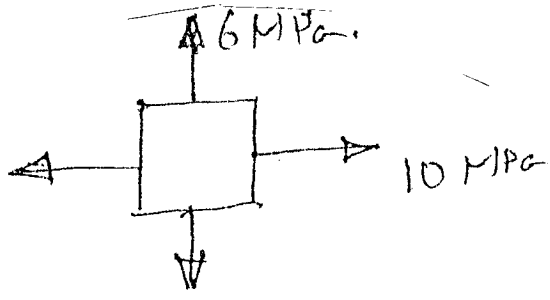
decrease in diameter Δd and increase in the volume Δv of the bar. (8)

(b) Determine the deformation of steel rod shown below: (7)

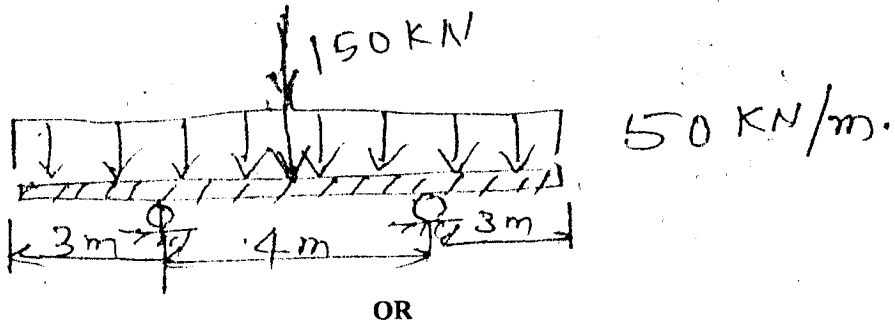


OR

For the plane stress shown in the following figure draw the three Mohr's principal circle diagrams and determine the state of stress for maximum shear. (15)



Draw the shear force and bending moment diagram for the following beam loaded and supported as shown. (15)



OR

A solid metal shaft of diameter 50mm and length 2m is twisted in a testing machine until one end rotates through an angle of $\phi = 5^0$ with respect to the other end. For this angle of twist the torque is measured as T = 750 N.m. calculate the maximum shear stress cause in the shaft and the shear modulus of elasticity G. (15)

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