Register Number:……..

B.E/B.TECH DEGREE EXAMINATIONS DEC 2012

Second Semester

MEC102: ENGINEERING MECHANICS

(Common to AERO/CE/MCE/ME/FT/TXT/BT)

Time: Three Hours **Maximum Marks:100**

Answer ALL Questions:-

PART A (10x1=10 Marks)

1. Condition of static equilibrium are

   (a) ΣH=0; ΣV=0; ΣM=0 (b) H=0;V=0; (c) V=0;M=0; (c) h=0;M=0

2. If the two forces of magnitude P acts at an angle θ. Then resultant will be

   (a) 2Pcos θ/2 (b) 2Psin θ (c) 2Pcos θ (d) 2Pcos 2θ

3. Varignons theorem is also known as

   (a) Theorem of force (b) Theorem of moments

   (c) Theorem of momentum (d) All of the above

4. Example of rigid body is

   (a) Cast iron (b) Springs (c) Wires (d) None of the above

5. The centroid of a semi-circle of radius ‘r’ is at a distance of ‘h’ from the diameter where ‘h’ is equal to

   (a) r/3π (b) 3r/4π (c) r/4π (d) 4r/3π

6. The perpendicular axis theorem is given by

   (a) Ix=Iy+Iz (b) Iy=Iz+Ix (c) Iz=Ix+Iy (d) Iz=Ix-Iy

7. A ladder is resting on ground and leaning against a smooth wall. The force of friction is ---------- at the upper end.

   (a) Maximum (b) Minimum (c) Zero (d) Unity

8. The frictional force is ------- of area of contact

   (a) Dependent (b) Inversely proportional

   (c) Independent (d) None of the above

9. The study of bodies subjected to forces which are unbalanced is

   (a) Kinematics (b) Kinetics (c) Statics (d) Dynamics

10. The freely projected particle which moves under the combined effect of vertical and horizontal motion is

(a) Upword motion (b) Projectile motion

(c) Downword motion (d) None of the above

PART B (10x2=20Marks)

11. State lami's theorem.
12. What is equilibrant?
13. State Varignons theorem.
14. What is a couple?
15. State parallel axis theorem.
16. What is principal axis?
17. What is impending motion?
18. What is angle of repose?
19. What is curvilinear motion?
20. Define potential energy.

PART C (5x14=70 Marks)

21. a) A and B weighing 40 N and 30 N respectively, rest on smooth plane as shown in figure-1. They are connected by a weightless cord passing over a frictionless pulley. Determine the angle θ and the tension in the cord for equilibrium.

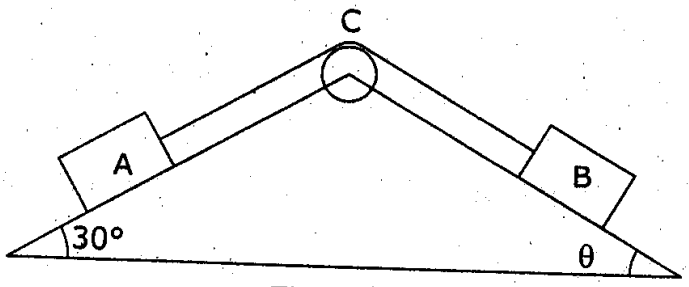

Figure-1

(OR)

b) A ball of weight 120 N rests in a right angled groove as shown in figure-2. The sides of the groove are inclined at an angle of 30º and 60 º to the horizontal. If all the surfaces are smooth, then determine the reactions R_A and R_C at the points of contact.

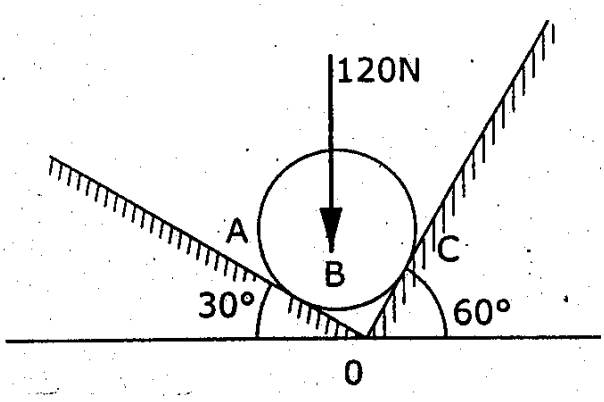

Figure-2

22. a) Blocks A and B of weight 200 N and 100 N respectively, rests on a 30 º inclined plane and are attached to the post which is held perpendicular to the plane by force P, parallel to the plane, as shown in figure-3. Assume that all the surfaces are smooth and that the cords are parallel to the plane. Determine the value of P. Also find the normal reaction of block A and B.

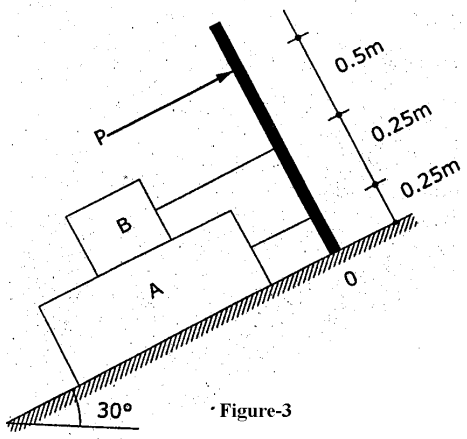

Figure-3

(OR)

b) A fixed crane has a mass of 1000 kg and is used to lift 2400 kg crate. It is held in place by a pin at A and a rocker at B as shown in figure-4. The centre of gravity of the crane is located at G. Determine the components of reaction at A and B.

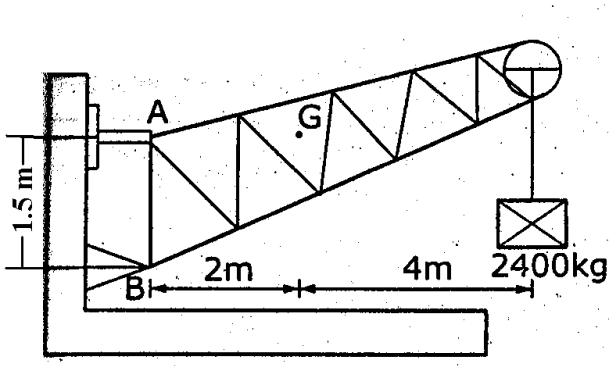

Figure-4

23. a) Find the moment of inertia of an angle section shown in figure-5 about its centroidal axes.

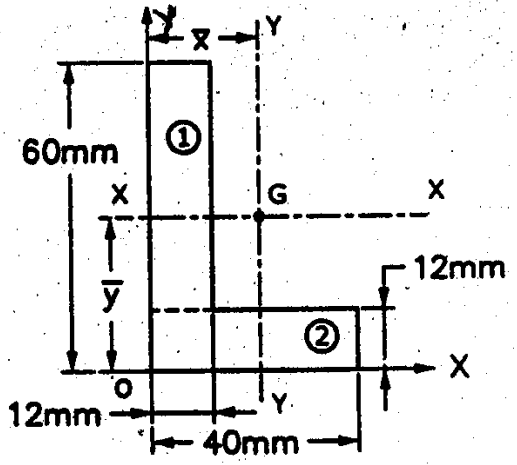

Figure-5

(OR)

b) Determine the product of inertia of the angle section shown in figure-6 with respect to its centroidal axes.

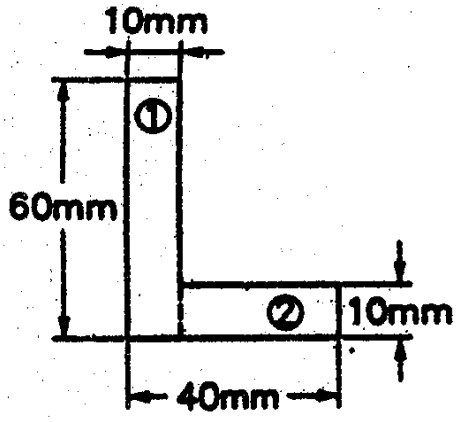

Figure-6

24. a) Body A weighing 500 N rests over a block B which weighs 1000 N as shown in figure-7. Body A is tied to the wall with a horizontal string. If the Co- Efficient of friction between

A and B is 0.25 and between the floor and B is 0.4. What should be the value of P to move the block B.

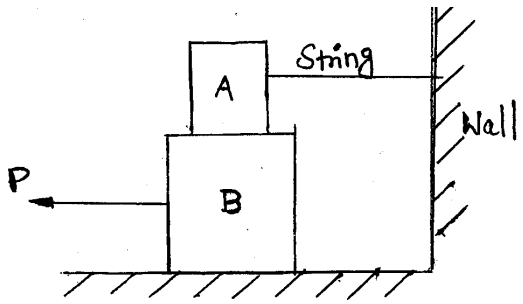

Figure-7

(OR)

b) A ladder 7m long rests on the ground and leans against a smooth vertical wall at an angle of 60º with the horizontal. The weight of the ladder is 500 N and acts at its middle when a mass of weight 700 N stands on the ladder at a distance of 2.5 m from the bottom of the ladder, the ladder is at the point of sliding. Determine the co-efficient of friction between ladder and the floor.

25. a) A body freely falling under the action of gravity passes two points 10 m apart, vertically in 0.2 sec. From what height above the higher point did it start to fall? g =9.81 m/s^2

(OR)

b) Two weights 80 N and 20 N are connected by a thread and move along a rough horizontal surface under the action of a force 40 N, applied to the first weight of 80 N as shown in figure-8. The co- efficient of friction between the sliding surface of the weight and the plane is 0.3. Determine the velocity of the system after 2 sec. Also calculate the tension in the string using impulse-momentum equation.

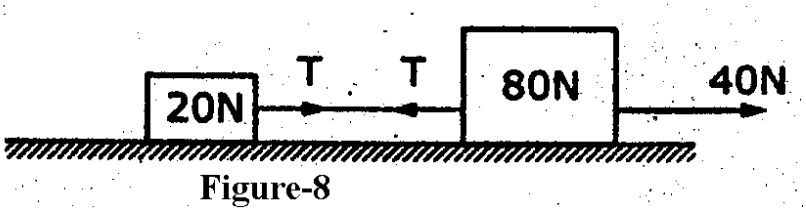

Figure-8

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