Code No. : 6007

FACULTY OF ENGINEERING AND INFORMATICS

B.E. I Year (Common to All Branches) (Main) Examination, June 2010

ENGINEERING MECHANICS

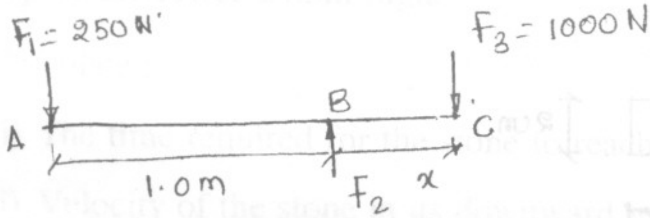
Time: 3 Hours] [Max. Marks: 75

Instructions : *Answer **all** questions of Part **A**.*
*Answer **five** questions from Part **B**.*
***Assume** missing data, **if any** suitably.*

PART – A (25 Marks)

1. State Lamis theorem. 2

2. Three parallel forces F_1, F_2, F_3 are acting on a body as shown below. The body is in equilibrium. If F_1 = 250 N and F_3 = 1000 N and the distance between F_1 and F_2 is 1.0 m. Determine the magnitude of force F_2 and the distance of F_2 from force F_3. 2



3. State Pappu's theorem I and II. 3

4. Differentiate between static and dynamic friction. 2

5. State and prove perpendicular axis theorem. 3

6. Mass moment of inertia of a sphere of mass 'm' and radius '2r' about any diameter is ________ 2

7. Define rectilinear translation and curvilinear translation. 3

8. Explain what is meant by dynamic equilibrium. 3

9. A block of weight 30 N is placed on a smooth inclined plane which makes 45° with horizontal. Calculate the work done when the block is pulled up by 5 m. 3

10. Determine the length of simple pendulum whose period is 2.5 sec. 2

PART – B (50 Marks)

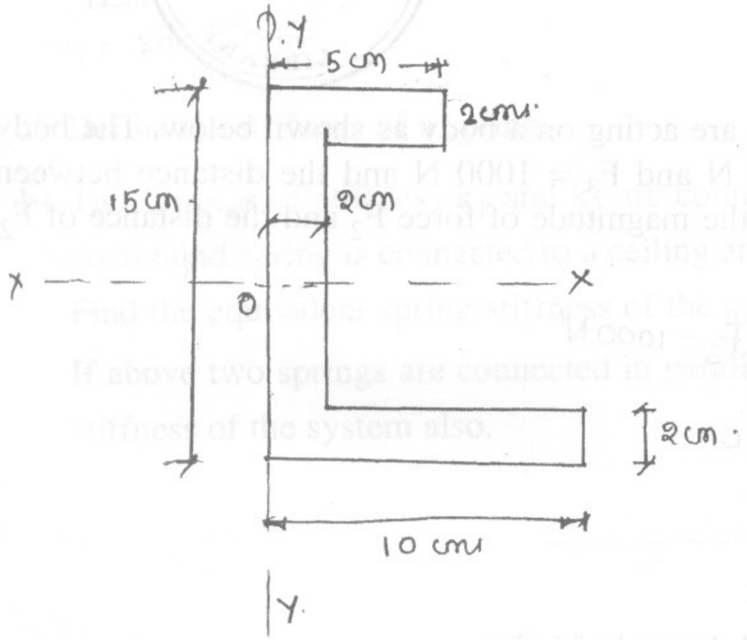
11. Determine the resultant of the system of concurrent forces having the following magnitudes and passing through the origin (0, 0, 0) and the points

    A = 250 N (+13, + 7, –3)

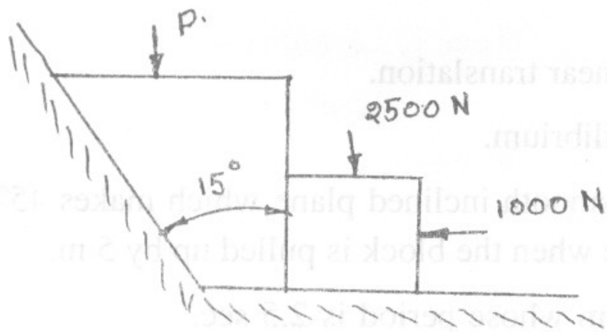
    B = 450 N (–8, – 4, +7)

    C = 300 N (+7, – 4, –5). **10**

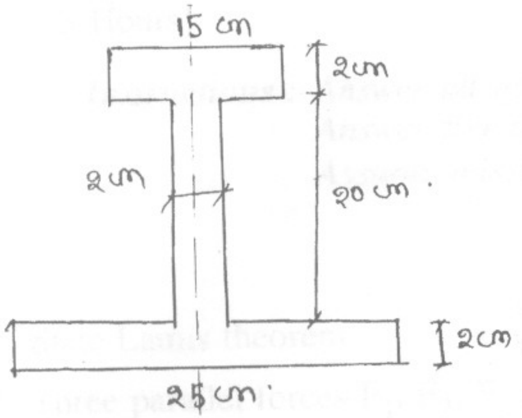
12. Find the CG of the section shown below about XX and YY axis. **10**



13. Determine the value of force P required to start the wedge shown in Fig. The angle of friction for all the surfaces in contact is 15°. **10**



14. Find the moment of inertia of the section shown below about centroidal xx and yy axis. Also find the least radius of gyration. 10



15. a) A stone is thrown vertically upwards with a velocity of 19.6 m/sec from the top of the tower 24.5m high. 5

Calculate :

i) The time required for the stone to reach the ground.

ii) Velocity of the stone in its downward travel; at the point in the same level as the point of projection.

iii) The maximum height to which the stone will rise in its flight.

Take $g = 9.8$ m/sec^2.

b) A bullet of mass 80 gm and moving with a velocity of 300 m/sec is fired into a log of wood and it penetrates to a depth of 10 cm. If the bullet moving with the same velocity were fired into a similar piece of wood 5 cm thick, with what velocity would it merge ? Also find the force of resistance assuming it to be uniform. 5

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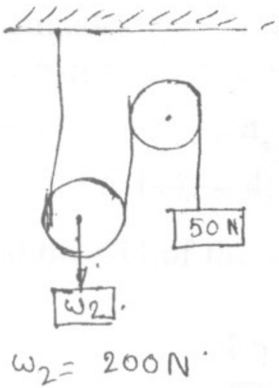
16. A system of frictionless pulleys carries two weights hung by cords as shown. Find the tension in the cords and acceleration of the system. **10**



17. a) Define the stiffness of a spring. **2**

b) Two springs of stiffness k_1 and k_2 are connected in series. Upper end of the compound spring is connected to a ceiling and the lower end carries a load W. Find the equivalent spring stiffness of the system.

If above two springs are connected in parallel then find the equivalent spring stiffness of the system also. **8**
