Roll No. | | | | | | | | | | | | |

Total No. of Pages : 04

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2011 & Onwards) (Sem.–3)

ENGINEERING MECHANICS

Subject Code : BTAR-303

M.Code : 63003

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

a. State triangle law of forces.

b. Define the term free body diagram.

c. State laws of friction.

d. Define coefficient of friction and limiting friction.

e. Define the term velocity and acceleration.

f. What do you understand by the term 'Reversibility' of a machine?

g. Define kinematics and dynamics.

h. Define the terms: Mass of a body and weight of a body.

i. What do you understand by potential energy and kinetic energy of a body?

j. What is an ideal machine?

SECTION-B

2. Find the x and y components of force system shown in figure below. Also find resultant of the given forces.

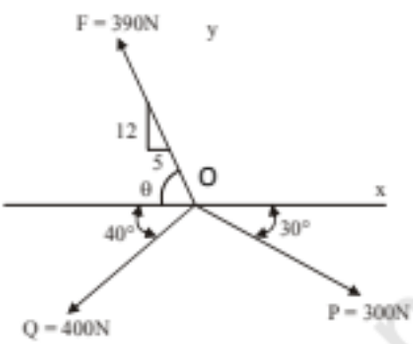

Fig.1

3. A vehicle starts from rest at a point O and travels along a straight line with acceleration $2m/s^2$. Another vehicle starts from rest at the same point 4 seconds later and travels along the same path with an acceleration of 3 m/s^2. How far from O will the second vehicle overtake the first vehicle?

4. In a lifting machine, whose velocity ratio is 50, an effort of 100 N is required to lift a load of 4 kN. Is the machine reversible? If so, what effort should be applied, so that the machine is at the point of reversing?

5. Two identical spheres, each of radius 5 cm and weight 150 N as shown in the figure below, are connected with a string of length 16 cm, and rest on a horizontal smooth floor. Another sphere of radius 6 cm and weight 200 N rest over them. Determine the tension in the string and reaction at all contact surfaces.

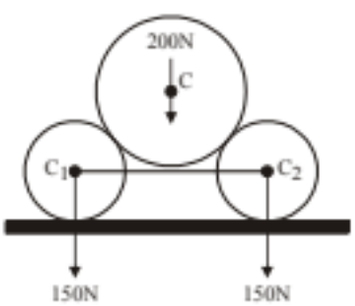

Fig.2

6. Compute the magnitude of the force F, whose components along the x, y, and z direction are 15 kN, 26 kN and -33 kN, respectively. Also compute the inclination with all axes.

SECTION-C

7. For the pin-jointed plane truss, loaded and supported as shown in the figure, determine axial forces in the member BD, BF and CF. Use any of the methods for analysis of trusses.

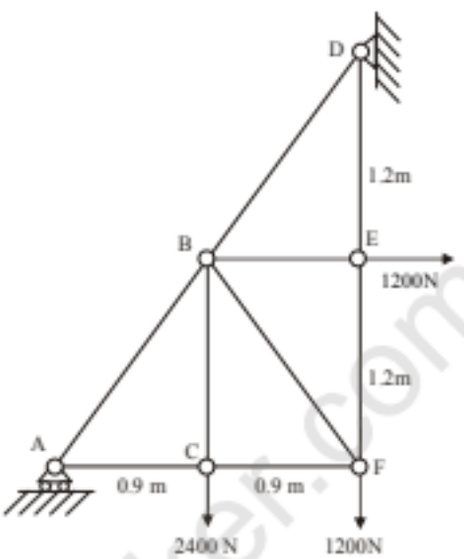

Fig.3

8. A wedge and a block are placed as shown in the figure below. The coefficients of friction for the surfaces are as follows: 0.25 at the floor, 0.3 at the wall and 0.2 between the wedge and the block. Find the minimum value of a horizontal force P applied to the lower block that will hold the system in equilibrium.

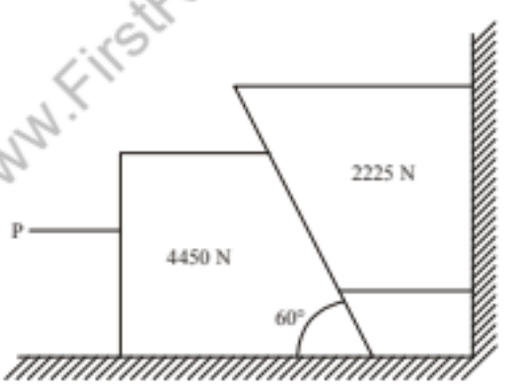

Fig.4

9. Neglecting the friction and inertia of the two pulleys, as shown in the figure, find the acceleration of the weight Q, assuming that P = Q. Use the D' Alembert's principle.

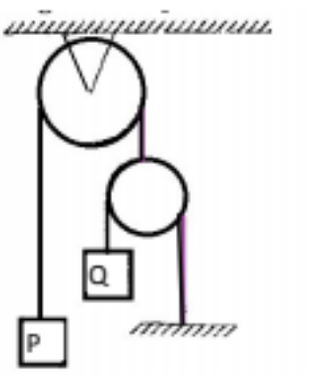

Fig.5

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.