Hall Ticket Number:

Code No. : 12008

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) II-Semester Main Examinations, May-2017

Engineering Mechanics

(Civil, Mech. & EEE)

Time: 3 hours Max. Marks: 70

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Define radius of gyration.
2. Find the expression for the radius of gyration of a square plate of side "a" about an axis passing through the centroid?
3. A body travelling with a constant speed of 20 kmph brought to rest by the application of brakes in 5 seconds. What is the acceleration acting on the body?
4. A block of weight 50 N slides down along an inclined plane. It travelled through a distance of 5m along the inclined plane, starting from rest, in 2 seconds. Neglecting friction, determine the inclination of the plane with the horizontal.
5. A force of 200 N acts for 0.8 seconds on a body of mass 604 kg which is initially at rest. Find the velocity attained by the body.
6. Differentiate between translation and rotation.
7. State and explain work-energy principle.
8. Write work-energy equation for plane motion of a rigid body.
9. State the principle of linear momentum. State its applications.
10. Define coefficient of restitution.

Part-B (5 × 10 = 50 Marks)
(All bits carry equal marks)

11. a) Determine the mass moment of inertia of a cone of base radius "R", height "h" and mass "M" about an axis passing through its centroid and apex.

    b) Determine the product of inertia of a plane right angled triangular section of height "H" and base "b" about axes passing through centroid and parallel to base and height.

12. a) Body A is thrown with a velocity of 10m/s at an angle of 60^0 to the horizontal. If another body B is thrown at an angle of 45^0 to the horizontal, find its velocity if it has the same
        i) horizontal range
        ii) maximum height
        iii) time of flight, as the body A.

    b) The acceleration "a" of a particle expressed in cm/sec^2 is given by $a = 90-5x^2$, where x is the distance traveled by the particle in cms. Determine the velocity of the particle for x = 5cms.

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13. a) What is instantaneous center of rotation? The 2-m-long bar is confined to move in the horizontal and vertical slots *A* and *B*. If the velocity of the slider block at *A* is 6 m/s, determine the bar's angular velocity and the velocity of block *B* at the instant θ=60°. (Fig.1)

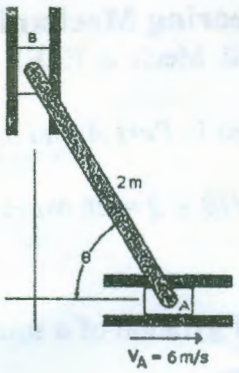

Fig.1

b) A pulley weighing 12 N and having a radius of gyration of 8 cm ia connected to two blocks as shown in Fig. 2. Assuming no axle fricion, determine the angular accelaration of the pulley and the accelaration of each block.

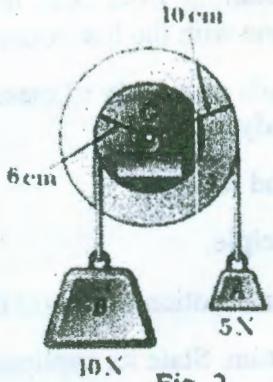

Fig. 2

14. a) The initial velocity of 500 N block is 6 m/sec towards left. At this stage a weight of 250N is applied as shown in Fig. 3. Determine the time at which the block has a velocity of 4 m/sec to the right. Take coefficient of friction as 0.2 and the pulley is friction less.

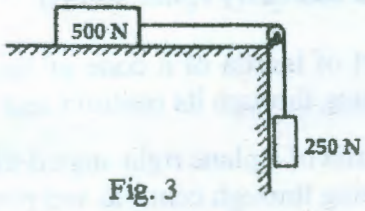

Fig. 3

b) Find the tension in the string during the motion of the system shown in Fig. 4. Take W1 = 900N and W2 = 450N. The system is in vertical plane and the coefficient of friction between incline and block of weight W_1 is 0.2. Neglect friction in the pulley.

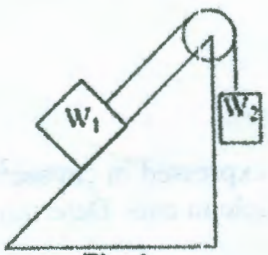

Fig. 4

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15. a) A bullet of mass 0.5 kg moving with a speed of 30m/sec was fired into a wooden block of weight 200N, resting on an incline, and inclined 30^0 to the horizontal. If the coefficient of friction is 0.35, find the distance the block travels along the incline in the upward direction.

    b) Ball A of mass 1 kg moving with velocity of 2 m/sec strikes directly on a ball of mass 2 kg at rest. Ball A after striking comes to rest. Find coefficient of restitution.

16. a) Derive an expression to find mass moment of inertia for the sphere of radius "R" and mass 'm' about any diameter.

    b) Two blocks of weight $W_1 = 150N$ and $W_2 = 100N$ rest on rough inclined plane and are connected by a flexible string as shown in Fig. 5. If the coefficient of fiction between the W_1 and incline is 0.3 and the same between W_2 and incline is 0.5, determine the angle defined by the incline with horizontal for sliding to impend.

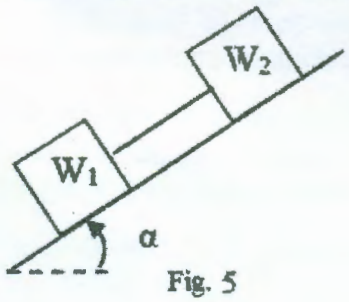

Fig. 5

17. Answer any ***two*** of the following:

    a) Compute the acceleration of body 'B' and the tension in the cord supporting body 'A' shown in Fig. 6.

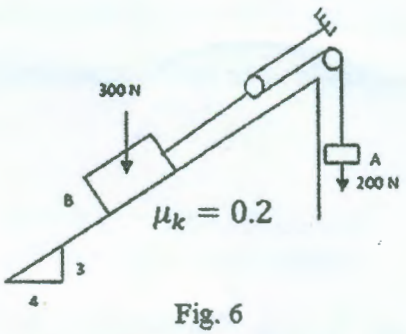

Fig. 6

    b) An elevator has a downward acceleration of 1 m/s^2. What pressure will be transmitted to the floor of the elevator by a man weighing 500 N travelling in it?

    c) Find the work done in drawing a body weighing 500 N through a distance of 4 m along a horizontal surface by a force of 200 N making an angle of 300 with the horizontal.