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Code No. : 1206

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. I Year II - Semester (Main) Examinations, July – 2015

Engineering Mechanics – II
(For Civil, Mechanical and EEE Branches)

Time: **3** hours Max. Marks: **70**

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

Part-A (10 X 2=20 Marks)

1. State parallel axis theorem for mass moment of inertia.
2. Define radius of gyration and product of inertia.
3. A block of mass 80kg rests on a horizontal plane. Compute the magnitude of horizontal force 'P' required to give the block an acceleration of a = $4m/s^2$ to the right. The coefficient of friction between the block and the plane is 0.30.
4. State the difference between particle motion from rigid body motion.
5. Define the principle of work energy.
6. A lift weighing 5kN moves up with an acceleration of $2.5m/sec^2$. Compute the tension in the cable of the lift.
7. List out the examples for center of percussion.
8. Identify instantaneous center of rotation of a wheel rolling freely on an inclined plane.
9. Indicate the application part of simple harmonic motion.
10. State the condition for the phenomenon of resonance occurring in vibrating system.

Part-B (5 X 10=50 Marks)

11. a) Derive an expression for the moment of Inertia of a homogeneous right circular cone of mass 'm' base radius r, and altitude 'h' with respect to its geometrical axis. [5]

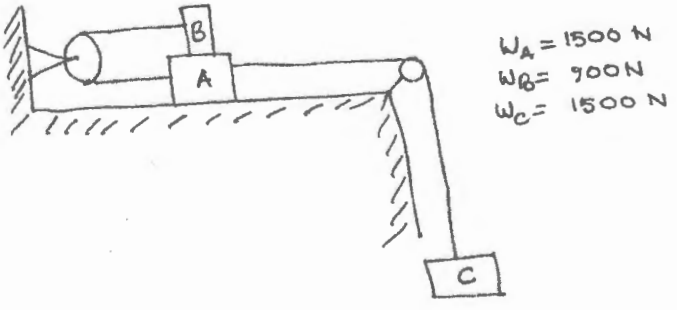
    b) Compute the product of Inertia of the quarter circular area of radius r with respect to base axis. [5]

12. a) The position of the particle is defined by the relation $y = 15t+3t^2 - t^3$ where y is in meters and 't' is in seconds. Calculate the position, velocity and acceleration at t = 2s and 3s. [5]

    b) A particle is projected with a given velocity 'vO' at an angle of elevation 'a' from the Origin. It passes through two points (15, 8) and (40, 9) on its path. Compute the greatest height reached by the particle and its range. [5]

13. a) Explain the advantages of using D-Alembert's Principle over work energy principle. [3]

    b) Calculate the acceleration of the block A for the system if the system starts from rest. Coefficient of friction between block 'A' and the table is 0.25 and that between 'A' and 'B' is 0.35. [7]



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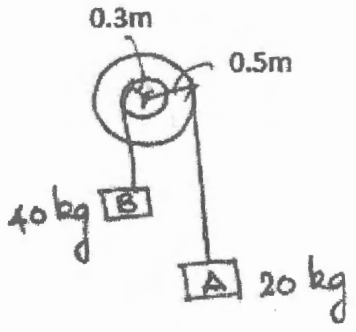
14. a) Define the term Work, Power and Energy [3]

b) Two bodies of weight wa = 800N and wb = 5OON are connected to the two ends of light inextensible strings which passes over a smooth pulley. The weight 800N is placed on an inclined plane of angle 15o and block 'B' is vertically hanged in the air. If the coefficient of friction is 0.2, determine the velocity or the block 'B ' if it falls through a vertical distance of 2.0m. [7]

15. a) Explain the terms normal acceleration and tangential acceleration. [3]

b) A 100 kg pulley having a radius of gyration of 0.4m is connected to two cylinders as shown below. Assume no axle friction and determine the angular acceleration of the pully and the acceleration of each cylinder. [7]



16. (a) Explain the terms free vibration, forced vibrations and damped vibrations. [3]

(b) Determine the stiffness of a spring to which a weight of 120N is attached and set vibrating vertically. The weight makes 6 oscillations / sec. [7]

17. Answer any two of the following.

a) Calculate the speed at which a car will begin to skid when turning on a flat curve of radios 30m. taking co-efficient of friction between tyres and ground as 0.7. [5]

b) A bullet travelling horizontally with a velocity of 600m/sec and weighing 0.25N strikes a wooden block of weight 5ON resting on a rough horizontal floor. Find the distance through which the block is displaced from its initial position. Coefficient of friction between the floor and the block is 0.45. [5]

c) Compute the stiffness of each of the spring, when a helical compression spring is cut into two halves. [5]

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