**20ME204**

**Hall Ticket Number:**

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| **I/IV B.Tech (Regular) DEGREE EXAMINATION** | | |
| **October, 2021** | **Mechanical Engineering** | |
| **Second Semester** | **Engineering Mechanics-II** | |
| **Time:** Three Hours | **Maximum: 7**0 Marks | |
| Answer Question No. 1 compulsory. | | (1 x 14 = 14 Marks) |
| Answer ONE Question from each unit. | | (4 x 14 = 56 Marks) |
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| 1. | a) | Define dynamics. |  |
|  | b) | What are the types of particle motion? |  |
|  | c) | The area under acceleration-time (a-t) curve represents\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |  |
|  | d) | What is dynamic equilibrium? |  |
|  | e) | Differentiate between kinematics and kinetics. |  |
|  | f) | A lift of weight 5000 N moves up with an acceleration 2 m/sec2. Determine the tension in the cable of the lift. |  |
|  | g) | State the principle of impulse and momentum. |  |
|  | h) | What is direct central impact? |  |
|  | i) | What do you mean by radius of gyration? |  |
|  | j) | Write the equation for mass moment of inertia of circular disc of mass ‘M’ and radius ‘R’ about the axis passing through its centre and perpendicular to the plane of disc. |  |
|  | k) | If a body is rotating about an axis with angular velocity ω, what is the velocity of a point located at a distance r from axis of rotation? |  |
|  | l) | What are the equations of motion for a rigid body rotating about fixed axis? |  |
|  | m) | Define instantaneous centre of rotation. |  |
|  | n) | What is general plane motion of rigid body? |  |
|  |  | **UNIT-I** |  |
| 2. | a) | A stone is dropped into a well and falls vertically with constant acceleration g. The sound of impact of the stone on the bottom of the well is heard 6.5 s after it is dropped. If the velocity of sound is 336 m/s, how deep is the well? | 7M |
|  | b) | A particle moves along a straight line such that its displacement at any time t is given by x = t3‒6t2+3t+4 metres. Determine the velocity of particle when the acceleration is zero. | 7M |
|  |  | **(OR)** |  |
| 3. | a) | Derive tangential and normal components of acceleration when the particle is moving along a curved path. | 7M |
|  | b) | A car starts from rest on a curved road of 250 m radius and accelerates at a constant tangential acceleration of 0.6 m/s2. Determine the distance and the time for which that car will travel before the magnitude of the total acceleration attained by it becomes 0.75 m/s2. | 7M |
|  |  | **UNIT-II** |  |
| 4. |  | A block of mass 30 kg is resting on a horizontal table 1.5 m from its edge. The block A is attached to the string whose other end is carrying a body B of mass 3 kg. If the coefficient of friction between the block A and the table is 0.06, find the acceleration of the system and the time required for the block A to fall over the edge. | 14M |
|  |  | **(OR)**  **P.T.O.**  **20ME204** |  |
| 5. |  | An automobile of weight ‘W’ travels with uniform speed ‘v’ over a curve ACB which is parabolic (x2 = ky) as shown in figure. Determine the total force ‘R’ exerted on the road by four wheels of car as it passes the crest C if h = 1.2 m, L = 60 m and v = 96 kmph. | 14M |
|  |  | **UNIT-III** |  |
| 6. | a) | State and prove work energy theorem. | 7M |
|  | b) | A shell of mass 50 kg is fired horizontally with a velocity of 300 m/sec by a gun of 3000 kg mass. Determine (i) the velocity with which the gun recoils, (ii) uniform force required to stop the gun in 0.6 m distance and (iii) time required to stop the gun. | 7M |
|  |  | **(OR)** |  |
| 7. |  | Determine the mass moment of inertia of solid right circular cone of radius ‘r’ and height ‘h’ and mass ‘m’ about i) its geometric axis and ii) an axis through apex and perpendicular to the geometric axis. | 14M |
|  |  | **UNIT-IV** |  |
| 8. |  | A grinding wheel is attached to the shaft of an electric motor of rated speed of 1800 rpm. When the power is switched on the unit attains the rated speed in 5 s and when the power is switched off the unit coasts to rest in 90 s. Assuming uniformly accelerated motion, determine the number of revolutions the unit turns (i) to attain the rated speed (ii) to come to rest. | 14M |
|  |  | **(OR)** |  |
| 9. |  | A circular cylinder of mass m and radius r is suspended from a cord that is wound around its circumference is shown in figure. If the cylinder is allowed to fall freely, prove that the tension in the cord is equal to that of 1/3rd of weight of the drum. Also find out the acceleration in terms of acceleration due to gravity. | 14M |

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