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**Code No: A10306**

**MLR15**

**MLR INSTITUTE OF TECHNOLOGY**   
(An Autonomous Institution)   
B.Tech I Year II Sem Examinations- June-2016

**ENGINEERING MECHANICS-II**(MECH)

Time : 3 hours Max.Marks :75

Note: 1. This question paper contains two parts A and B.   
 2. Part A is compulsory which carries 25 marks. Answer all Questions in part A.   
 3. Part B consists of 5 units. Answer any one full question from each unit. Each question carries 10   
 Marks and may have a,b,c as sub questions.

**PART-A [25 Marks]**

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| **1** | a) | What do you mean by linear motion? Give some examples of linear motion. | [2M] |
|  | b) | State the equations representing the dynamics of a rigid body in rotation about a fixed axis. | [2M] |
|  | c) | Define impulse. | [2M] |
|  | d) | State law of conservation of momentum | [2M] |
|  | e) | Define frequency of simple harmonic motion. | [2M] |
|  |  |  |  |
| **2** | a) | A car is moving with a velocity of 15 m/s. The car is brought to rest by applying brakes in 5 seconds. Determine the retardation. | [3M] |
|  | b) | Discuss kinetics of rigid bodies. | [3M] |
|  | c) | A body of weight 1500 N moves on a level horizontal road for a distance of 500 m. The resistance of the road is 10 N per 1000 N weight of the body. Find the work done on the body by the resistance. | [3M] |
|  | d) | What is the significance of impulse momentum equation. | [3M] |
|  | e) | Discuss different types of free vibrations. | [3M] |
|  |  | **PART-B [50 Marks]** |  |
| 3. |  | A stone is thrown vertically upwards with a velocity of 19.6 m/s from the top of a tower 24.5 m high. Calculate (i) 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 and (iii) The maximum height to which the stone will rise in its flight.  OR | [10M] |
|  |  | **OR** |  |
| 4. | a) b) | Define time of flight and horizontal range of a projectile.  A projectile is fired with an initial velocity of 250 m/s at a target located at a horizontal distance of 4 km and vertical distance of 700 m above the gun. Determine the value of a firing angle to hit the target. Neglect the air resistance. | [4M]  [6M] |
| 5. | a) | Explain D’Alembert principle | [4M] |
|  | b) | Two bodies of weight 20 N and 10 N are connected to the two ends of a light inextensible string, passing over a smooth pulley. The weight of 20 N is placed on a horizontal surface while the weight of 10 N is hanging free in air. The horizontal surface is a rough one and having coefficient of friction between the weight 20 N and the plane surface equal to 0.3, determine (i) the acceleration of the system (ii) the tension in the string. | [6M] |
|  |  | **OR** |  |
| 6. |  | Two bodies directly in line and 10 m apart are held stationary on an inclined plane having inclination of 20o. The coefficient of friction between the plane and first body is 0.08 and that between the plane and the second body is 0.05. If both the bodies are set in motion at the same instant, calculate the distance through which each body travels before they meet together. | [10M] |
| 7. |  | A bullet of mass 81 gm and moving with a velocity of 300 m/s is fired into a block 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 emerge? Find also the force of resistance, assuming it to be uniform. | [10M] |
|  |  | **OR** |  |
| 8. | a) | Derive an expression for the coefficient of restitution when two bodies are in direct impact. | [5M] |
|  | b) | Ball A of mass 1 kg moving with a velocity of 2 m/s, strikes directly on a ball B of mass 2 kg at rest. The ball A, after striking, comes to rest. Find the velocity of ball B after striking and coefficient of restitution. | [5M] |
| 9. |  | The speed of flywheel rotating at a speed of 250 rpm is uniformly increased to 350 rpm in 5 seconds. Determine the work done by driving torque and increase in kinetic energy during this time. Take mass of the flywheel 30 kg and radius of gyration 25 cm. | [10M] |
|  |  | **OR** |  |
| 10. | a) | Explain the differences between direct central impact and oblique central impact. | [4M] |
|  | b) | A bullet of mass 30 grams has a velocity of 360 m/s. It is fired into a freely suspended block of wood of mass 0.575 kg in which it is remains embedded, how much kinetic energy is lost in impact. | [6M] |
| 11. | a) | Derive an expression for the time period of a simple pendulum performing simple harmonic motion. | [5M] |
|  | b) | A vertical shaft 5 mm in diameter and 1m in length has its upper end fixed to the ceiling. At the lower end it carries a rotor of diameter 200 mm and weight 20 N. The modulus of rigidity for the material of the rotor is 0.85x105 N/mm2. Calculate the frequency of torsional vibrations for the system. | [5M] |
|  |  | **OR** |  |
| 12. | a) | Derive an expression for the time period of a compound pendulum performing simple harmonic motion. | [5M] |
|  | b) | Find the length of a simple pendulum to make (i) one complete oscillation per second (ii) half an oscillation per second. | [5M] |

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