I B. Tech II Semester Regular Examination, June, 2015
Engineering Mechanics-Dynamics
(Common to ME and CE)

Time: 3 hours   Max Marks: 70

PART – A
Answer ALL questions. All questions carry equal marks.
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10 * 2 Marks = 20 Marks

1). a   Explain types of motions and distinguish between uniform motion and accelerated motion [2]

   b   Derive a relation for the distance travelled by a body in the nth second. [2]

   c   Define the terms i) velocity of projection ii) angle of projection iii) time of flight iv) range of a projectile [2]

   d   Explain the term recoil of gun. How will you find the velocity of the bullet? [2]

   e   Define the following terms: (i) Work (ii) Energy [2]

   f   State law of Conservation of Momentum. [2]

   g   Explain the terms: (i) Simple Harmonic Motion (ii) Amplitude. [2]

   h   What are the important types of Free Vibrations? [2]

   i   Define and explain the term Torsional Vibrations [2]

   j   Find the expression for Natural Frequency of free torsional vibrations when the effect of inertia of the shaft is considered. [2]

PART – B
Answer any FIVE questions. All questions carry equal marks.
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5 * 10 Marks = 50 Marks

2. a).The motion of a particle in rectilinear motion is defined by the relation $s = 2t^3 - 9t^2 + 12t - 10$ where s is in meters and t in seconds. Find (a) Acceleration of particle when the velocity is zero (b) the position and the total distance travelled when acceleration is zero. [6]

   b). A projectile is fired with a velocity of 300m/sec upwards at angle of 60^0 to the horizontal. Neglecting air resistance determine: (i) time of flight (ii) range and (iii) greatest height reached by it. [4]

3. a). Derive the work energy equation for translation. [4]

   b). A block weighing 2500 N rests on a level horizontal plane which has coefficient of friction 0.20. This block is pulled by a force of 1000 N, which is acting at an angle of 30^0 to the horizontal. Find the velocity of the block after it moves 30 m, from the rest. If the force of 1000 N is then removed, how much further will it move? [6]

4 The system shown in fig 1 consist two bodies A= 1000N and B = 400N, has rightward velocity of 4 m/sec, just before a force P is applied. Determine the value of P that will give a left ward velocity of 6 m/sec in a time interval of 20 sec. Take coefficient of friction 0.2 and assume ideal pulley. Using Impulse momentum method.
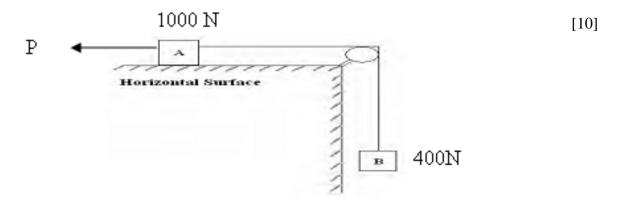
[10]

fig 1

5. a). Derive a relation between torque and angular acceleration of a body rotating about an axis. [3]

   b). A solid cylindrical pulley of mass 800 kg, having 0.8 m radius of gyration and 2m diameter, is rotated by an electric motor, which exerts a uniform torque of 60kN-m. A body of mass 3 tons is to be lifted by a wire wrapped round the pulley. Find (i) acceleration of the body and (ii) tension in the rope. [7]

6. a).Show that when a particle moves with Simple Harmonic Motion, its time for complete oscillation is independent of the amplitude of the motion. [4]

   b).A weight of 10N attached to a spring oscillates at a frequency of 60 oscillations per minute. If the maximum amplitude is 30mm, find the tension induced in the spring. Also find the spring constant and the maximum velocity in the spring. [6]

7. a).What is Compound Pendulum? Derive an expression for the period of a Compound Pendulum. [5]

   b).Define the term "length of equivalent simple pendulum" Obtain an expression for the same. [5]

8. a).What is the Torsional Pendulum?. Derive an expression for the period of a Torsional Pendulum. [4]

   b).A horizontal disc has a 40 cm diameter and 2.5 cm thickness. It mass is 12 kg. It is attached at its centre to a rod of 1 cm diameter and 1.5 m length. Modulus of rigidity of the rod is 4×10^8 N/m^2. Calculate the time period of torsion of vibrations of the disc [6]

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