

**B.Tech I Year(R07) Supplementary Examinations, May/June 2010**  
**CLASSICAL MECHANICS**  
**(Mechanical Engineering)**

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
All Questions carry equal marks

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1. The resultant of the two forces when they act at an angle of  $65^\circ$  is 20 N. If the same forces are acting at right angles their resultant is 16.5 N. Determine the magnitude of the two forces.
2. Five strings are tied at a point and are pulled in all directions, equally spaced, from one another. If the magnitude of the pulls on three consecutive strings is 70 N, 40 N and 55 N respectively, find graphically the magnitude of the pulls on two other strings, if the system is in equilibrium.
3. Force vector is represented by a line AB. The coordinates of point A are (2, 3, 4) and of point B (1,-2,5) respectively. If the magnitude of force is equal to 20 N, then determine
  - (a) the components of the force along x, y and z axes and
  - (b) angles with the x, y, z axes.
4. A cylinder of length 750 mm and diameter 150 mm is standing on its base. Determine the mass moment of inertia of the cylinder about
  - (a) the longitudinal axis and
  - (b) its base. Take the density of the material as  $7830 \text{ kg/m}^3$ .
5. The acceleration of a particle is defined by the relation  $a = 2e^{-0.3t}$ , where a and t are expressed in m/sec<sup>2</sup> and seconds, respectively. At  $x = 0$ ,  $v = 0$  of  $t = 0$ . Determine the velocity and position of the particle when  $t = 0.6\text{s}$ . [16]
6.
  - (a) If a body travels half its total path in the last second as its free fall, starting from rest, find the total time and height at its fall.
  - (b) A ball rolls off the top of a stairway with a horizontal velocity at 1.5 m/s. The steps are 20 cm wide and 20 cm high. Which step will the ball hit first? [8+8]
7. A particle which moves in rectilinear translation is acted upon by a resultant force R.
  - (a) Give the form of the impulse-momentum equation for the particle
  - (b) What is the linear momentum of the particle?
  - (c) What are the units of linear momentum?
  - (d) What is the graphical interpretation of an impulse? [16]
8. The block vibrates in SHM with a period of 5s when the two springs of constants  $K_1$  &  $K_2$  are connected in series and 2s when they are in parallel. Determine the ratio  $K_1 / K_2$  at the two spring constants. [16]

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