Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2012 & Onwards)   (Sem.–3)

ENGINEERING MECHANICS

Subject Code : BTAR-303
M.Code : 63003

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. **Answer briefly :**

    a. State general plane motion.

    b. Write the work energy equation of particles.

    c. State triangle law of forces.

    d. State the principle of work and energy for the general plane motion of rigid bodies.

    e. State D'Alembert's principle.

    f. What is impulsive force?

    g. Define coefficient of static friction.

    h. Define mechanical advantage of a machine.

    i. State the law of friction.

    j. State Lame's theorem.

SECTION-B

2. Compute the magnitude of the force F, whose components along x, y and z directions are 15 kN, –26 kN and –33 kN, respectively. Also compute the inclinations with all axes.

3. What are the different types of friction and explain them.

4. A ball is supported on a smooth wall by tieing a rod, as shown in Figure 1. Find the tension in the tie rod and support of the wall. The radius of ball is 5 cm, length of the rod 13 cm, and weight 120 N.
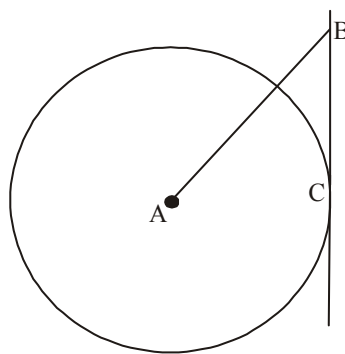
FIG.1

5. A truck of mass 15 tonnes travelling at 1.6 m/sec impacts with a buffer spring which compresses 1.25 mm per kN. Find the maximum compression of the spring.

6. In a system of pulleys of the first type, there are three pulleys, and a weight of 320 N can be just supported by an effort of 50 N. find the efficiency of the machine and the amount of friction.

SECTION-C

7. The motion of the particle is described by the equation $x = 2t^3 – 6t^2 – 18t + 24$ where x is in meter and t is in second. Determine the time, position, displacement and acceleration of the particle when its velocity becomes zero.

8. Distinguish clearly the difference between the working of a single purchase crab winch and a double purchase crab winch.

9. a. Explain any two principles of equilibrium.

   b. Explain the condition of equilibrium

   c. Discuss the various types of equilibrium.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.