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Total No. of Questions : 09

B.Tech.(Software Engineering) (Sem.–1)
ENGINEERING MECHANICS-I
Subject Code : EP-1700
M.Code : 77253

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 & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

l. **Answer briefly :**

   a) Derive the S.I. unit of joule in terms of fundamental units.

   b) Distinguish between scalar and vector product of two vectors.

   c) What do you mean by moment of a couple?

   d) Explain that a body can have zero average velocity but not zero average speed.

   e) Is it possible to round a curve, with zero acceleration? Explain.

   f) The greatest height to which a man can throw a stone is 'h'. What will be the greatest distance upto which he can throw the stone?

   g) A cricket player lowers his hands while catching a ball. Why?

   h) If no external torque acts on a body, will its angular velocity remain conserved?

   i) Two bodies of unequal masses have same linear momentum. Which one has greater kinetic energy?

   j) A shot fired from a canon explodes in air. What will be the changes in the momentum and the kinetic energy?

SECTION-B

2. State parallelogram law of vector addition. Find analytically the magnitude and direction of resultant vector, when (i) two vectors are parallel to each other, (ii) two vectors are perpendicular to each other.   (8)

3. a) A train was moving at a rate of 36 km h-1. When the brakes were applied, it comes to rest in a distance of 200 m. Calculate the retardation produced in the train. (4)

    b) From the top of a tower 100 m in height a ball is dropped and at the same instant another ball is projected vertically upwards from the ground so that it just reaches the top of the tower. At what height do the two balls pass one another? (4)

4. a) A uniform rod of 4 m long and weighing 15 kg is supported in a horizontal position on a fulcrum with weights of 20 and 25 kg suspended from its ends. Compute the position of fulcrum. (4)

    b) Define Moment of Force and explain the principle of moments. (4)

5. a) What is a couple? How is its moment measured? Show that it cannot be balanced except by a couple. (5)

    b) From what height must water fall from a dam to strike the turbine wheel with a speed-of 35 m/s? (3)

SECTION-C

6. a) Bring out the meaning of the term 'work'. When it is taken positive and when negative? How is it that it is assigned a sign but still taken as a scalar? (4)

    b) Define Energy and discuss the term kinetic energy. (4)

7. What is a uniform circular motion? Explain the terms; time period; frequency and angular velocity. Establish relation them. (8)

8. a) A bullet of mass 0.01 kg is fired horizontally into a 4 kg wooden block at rest on a horizontal surface. The coefficient of kinetic friction between the block and the surface is 0.25. The bullet remains embedded in the block and the combination moves 20m before coming to rest. With what speed did the bullet strike the block? (5)

    b) State and explain laws of limiting friction. (3)

9. a) Explain the concept of angular momentum and obtain an expression for it in Cartesian coordinates. (5)

    b) Find the angular momentum and kinetic energy of thin circular disc of mass 1 kg and radius 0.1 m, rotating with angular velocity 20π rad/s around the axis passing through its centre and perpendicular to its plane. (3)

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.