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Total No. of Pages : 04

Total No. of Questions : 18

B.Tech. (Software Engg) (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

Write briefly :

- 1) Differentiate between scalar and vector?
- 2) Define the coefficient of friction.
- 3) Define angle of repose and law of coulomb friction.
- 4) Define angular acceleration of rigid body?
- 5) Define Free Body Diagram (FBD).
- 6) Why friction is considered as necessary evil?
- 7) Define Newton's 2nd law of motion.
- 8) Explain the principle of a linear momentum.
- 9) What are the different types of units of measurement?
- 10) What is the geometrical interpretation of the dot product of two vectors?

SECTION-B

11 a) Derive the relation between the moment of a force and angular momentum.

b) Explain with diagram the principle of transmissibility.

c) The following forces act at a point :

i) 45 N inclined at 40° towards North of East

ii) 35 N towards North

iii) 20 N towards North West

iv) 25 N inclined at 60° towards South of West.

Find the magnitude and the direction of the resultant force.

12 a) i) Show that if three coplanar forces, acting at a point be in equilibrium, then, each force is proportional to the sine of the angle between the other two.

ii) Two men carry a weight of 2 kN by means of two ropes fixed to the weight. One rope is inclined at 45° and the other at 30° with their vertices. Find the tension in each rope.

b) Determine the tension developed in cable AB, AC & AD.

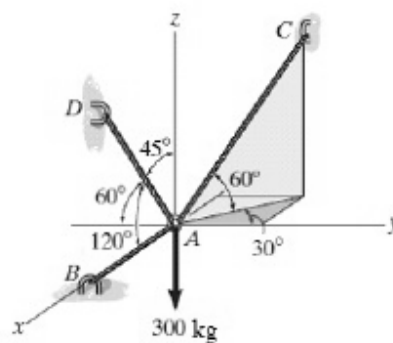


FIG. 1

- 13) a) What is a wedge? State its uses and the method of solving the problems on wedge friction.
- b) A load of 1.5 kN, resting on an inclined plane, can be moved up the plane by a force of 2 kN applied horizontally or by a force of 1.25 kN applied parallel to the plane. Find the inclination of the plane and the coefficient of friction.
- 14) A truss of 8 m span and 4 m height is loaded as shown in figure. Find the reactions at A and E.

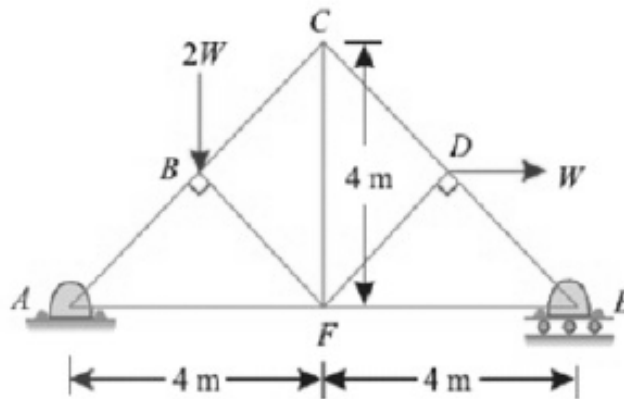


FIG. 2

SECTION-C

- 15) The angular acceleration of a flywheel is given by $\alpha = 12 - t$, where, α is in rad/s^2 and t is in seconds. If the angular velocity of the flywheel is 60 rad/s at the end of 4 seconds, determine the angular velocity at the end of 6 seconds. How many revolutions take place in these 6 seconds?
- 16) a) A bullet of mass 30 g is fired into a body of mass 10 kg which is suspended by a string 0.8 m long. Due to this impact, the body swings through an angle of 30° . Find the velocity of the bullet.
- b) What do you understand by the term "Energy". Explain the various forms of mechanical energies.

- 17) A 1 N ball is bowled to a batsman. The velocity of the ball is 20 m/s horizontally just before the batsman hits it. After hitting, it goes away with a velocity of 48 m/s at an inclination of 30° to horizontal. Find the average force exerted on the ball by the bat if the impact lasts for 0.02 seconds.
- 18) The 50-kg crate shown in Fig. rests on a horizontal surface for which the coefficient of kinetic friction is $\mu = 0.3$. If the crate is subjected to a 400-N towing force as shown. Determine the velocity of the crate in 3 s starting from rest.

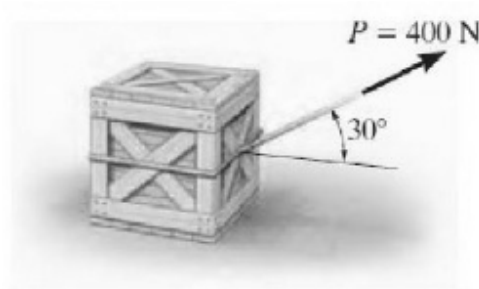


FIG. 3

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