Total No. of Questions : 09

B.Sc. – (Hons.)(Mathematics) (Sem.-6) MECHANICS Subject Code: UC-BSHM-603-19 M.Code: 92077 Date of Examination: 02-01-2023

Time: 3 Hrs.

INSTRUCTIONS TO CANDIDATES :

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION - B & C. have FOUR questions each.
- Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each. 3.
- Select atleast TWO questions from SECTION B & C. 4.

SECTION-A

L Write short notes on :

- a) Explain difference between work, power and energy.
- b) State Lami's Theorem.
- c) Define parallelogram law of forces. Find analytically the resultant of two component forces making an angle 'a' with each other.
- d) Define the terms Moment and Couple. Explain difference between them.
- e) Define Newton's second law of motion and Prove F = m. a
- f) At a point forces of 60 N and 90 N are acting and angle between them is 60° . Determine the magnitude and direction of their resultant.
- g) A man applies a horizontal force, perpendicular to the plane of the door, of 30 N on a doorhandle which is at a distance of 70 cm from the line of hinges. What is the moment tending to open the door?
- h) State the conditions of equilibrium of a concurrent coplanar force system in terms of moments only.
- i) Give reasons to show that the amount of frictional force developed does not depend upon the area of contact between the forces.
- i) i) Differentiate between velocity and speed of a particle.
 - ii) Differentiate between constant speed and constant velocity of a particle.

Max. Marks: 60

Total No. of Pages : 03

Roll No.

SECTION-B

2. Determine the resultant of the concurrent, coplanar force system shown in the following figure :



3. On a door knob, a force of 100 N is applied at an angle of 45° with the horizontal and in a plane perpendicular to the plane of the door as shown in the following figure. Determine the turning effect of the force about the hinges.



4. Determine the resultant of the parallel force system shown in the figure below:



5. A box weighing 8 KN is held at rest on a smooth plane inclined at 30° to the horizontal by the force P as shown in the following figure. Determine the value of P and the reaction at the plane.



SECTION-C

- 6. A body weighing 700 N rest on a rough horizontal surface. If $\mu_s = 0.4$,
 - a) Will the body move if a pull of 200 N is applied to it at 30° to the horizontal?
 - b) If this force is increased to 300 N, investigate the conditions of the body.
- 7. A train moving on a straight path starts from station A and moves with an acceleration of 0.20 ms⁻² for an interval of 1.5 minutes. Then it moves with uniform velocity for 10 minutes. Thereafter the train slows down by decelerating at 0.5 ms⁻² and halts at an station B. Determine the distance travelled by the train between the station A and B.
- 8. A ship starts from rest with an acceleration of 1 ms^{-2} due east. From north there is strong wind which causes the ship to shift southward at a constant velocity of 5 ms^{-1}
 - a) Find the resultant velocity and position of the ship with respect to starting point after 5 secs.
 - b) Find the above after 10 sees.
- 9. A motorised boat of mass 20 tonnes drifts in towards a dock at a speed of 2 metres/sec after its engine has been cut off. If the resistance offered by the water is 50 N per tonne, find the distance the boat will travel before coming to rest.

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.