

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Bachelor of Technology (Civil Engineering) SEMESTER - 1 Summer 2026 (Supply.)

Course :Bachelor of Technology (Civil Engineering) Branch : Engineering and Technology

Semester : SEMESTER - 1

Subject Code & Name: 24AF1EMES104 - ENGINEERING MECHANICS

Time : 3 Hours]

[Total Marks : 60

Instructions to the Students:

1. Each question carries 12 marks.
 2. Question No. 1 will be compulsory and include objective-type questions.
 3. Candidates are required to attempt any four questions from Question No. 2 to Question No.6
 4. Use of non-programmable scientific calculators is allowed.
 5. Assume suitable data wherever necessary and mention it clearly.
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Q1. Objective type questions. (Compulsory Question)

12

- 1 Which type of support allows rotation but prevents translation in both horizontal and vertical directions? a) Roller support b) Hinged support c) Fixed support d) Free support
- 2 What is the moment of a force about a point? a) The force divided by distance b) The product of force and perpendicular distance from the point c) The sum of all forces acting on a body d) The force parallel to the line of action
- 3 Lami's theorem is applicable when a body is in equilibrium under A) two forces B) three coplanar concurrent forces C) three parallel forces D) multiple non-concurrent forces
- 4 The centroid of a plane figure is the point A) where area is maximum B) where stress is maximum C) at which the whole area may be assumed concentrated D) where moment of inertia is zero
- 5 Reaction forces in a simply supported beam subjected to vertical loads are obtained using A) compatibility equations B) energy methods C) equilibrium equations D) strain relations
- 6 The principle of work and energy for a rigid body in translation states that: A) Work done = Change in kinetic energy B) Work done = Change in potential energy C) Work done = Force $\times$ Distance D) Work done = Momentum $\times$ Velocity
- 7 D'Alembert's Principle converts a dynamic problem into: A) Static problem B) Thermal problem C) Fluid problem D) Electric problem
- 8 In a free body diagram, the weight of the object is usually represented as acting: a) Horizontally b) At the centroid vertically downward c) Tangentially d) Incline
- 9 Which of the following is an example of a concentrated load? a) Self-weight of a beam b) Point force applied at a node c) Wind load d) Hydrostatic pressure
- 10 If a force system is in equilibrium, the algebraic sum of the moments about any point is: a) Maximum b) Minimum c) Zero d) Constant
- 11 Varignon's theorem states that the moment of a resultant force about a point is equal to: A) Sum of magnitudes of forces B) Algebraic sum of moments of individual forces about the same point C) Product of force and distance D) Zero for equilibrium

- 12 Rectilinear motion means motion along
 A) circular path
 B) curved path
 C) straight line
 D) random path
- Q2. Solve the following.
- A) Enlist and explain with neat sketch a) Types of supports b) Types of beams 6
- B) What is a force System? Give the Classification of force System. Explain with neat Sketch. 6
- Q3. Solve the following.
- A) Define 1) Moment 2) Couple 3) Free body diagram 6
- B) Find the magnitude and direction of the resultant of the concurrent forces of 10 N, 15 N, 25 N and 50 N making angles of 35° , 70° , 105° and 145° respectively with a positive x axis. 6
- Q4. Solve Any Two of the following.
- A) Define the terms. 1) Limiting Friction 2) Angle of Repose 3) Angle of Friction 6
- B) A small steel ball is shot vertically upwards from the top of a building 25 m above the ground with an initial velocity of 18 m/sec. a) In what time, it will reach the maximum height? b) How high above the building will the ball rise? 6
- C) Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400 N applied to the 800 N weight as shown in figure. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Using D' Alembert's principle, determine the acceleration of the weight and tension in the thread. 6
- Q5. Solve Any Two of the following.
- A) The motion of a particle moving in a straight line is given by the expressions $s = t^3 - 3t^2 + 2t + 5$ where, s is the displacement in metres and t is the time in seconds. Determine: velocity and acceleration after 4 seconds; (2) maximum or minimum velocity and corresponding displacement; (3) time at which velocity is zero. 6
- B) The distance between two stations A and B is 3.9 km. A train starts from station A and reach its speed 30 kmph in 20 seconds and travels until the speed reaches 36 kmph. This speed is maintained until brakes are applied and the train is brought to rest at the second station B under the retardation of 0.9 m/s^2 . Find the time taken to perform this journey. 6
- C) Two weights 200 N and 800 N are connected by a thread and they move along a rough horizontal plane under the action of a force of 400 N applied to the 800 N weight. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Using D' Alembert's principle, determine the acceleration of the weight and tension in the thread. 6
- Q6. Solve Any Two of the following.
- A) Elaborate briefly the procedure to find the magnitude and nature of forces in members of a truss by method of joint and method of section. 6
- B) State and prove the law of conservation of energy. 6
- C) State and explain in brief D' Alembert Principle. 6

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