

Dr. Babasaheb Ambedkar Technological University, Lonere

Supplementary Examination Summer 2024

Course: B. Tech. Branch: Common to All Branches

Subject Code & Name: Engineering Mechanics BTES103

Semester: I

Max Marks: 60

Date: 04/07/2024

Duration: 3 Hrs.

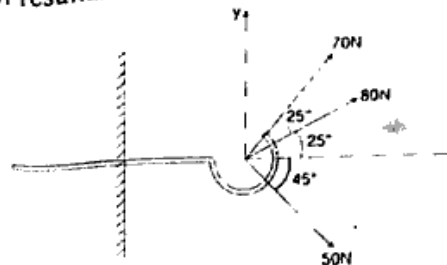
Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/CO) Marks

Q. 1 Solve any two of the following.

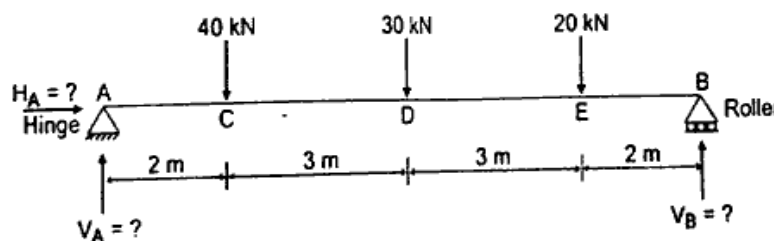
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|---|----------|----|
| A) Classify the system of forces with neat sketches & explain them in detail? | Remember | 06 |
| B) Calculate the magnitude and position of resultant of the three forces acting on a hook as shown in figure below. | CO2 | 06 |



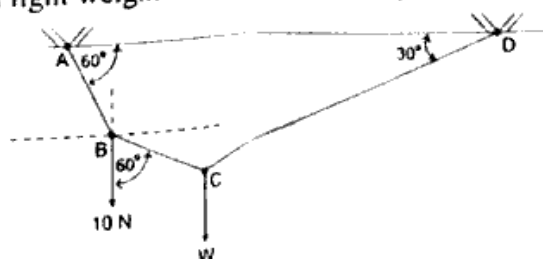
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| C) Explain the types loads in detail with neat sketches? | Remember | 06 |
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Q. 2 Solve any two of the following.

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| A) A simply supported beam of span 10 m carries three points loads of 40 kN, 30 kN and 20 kN from left hinge support at the distance 2 m, 5 m and 8 m respectively in downward direction. The right-hand support is roller. Find support reaction for the beam. | CO3 | 06 |
|---|-----|----|



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|---|-------------|----|
| B) A smooth sphere of radius r 150 mm and weight W 20 N is hung by string whose length equal the radius of sphere with contact to smooth vertical wall. Find inclination and tension in string as well as reaction of wall. | CO2 | 06 |
| C) Find the value of W if a light weight chain ABCD is suspended as shown in below figure below. | Application | 06 |



Q. 3 Solve any two of the following.

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|--|----------|----|
| A) Define: a) Static Friction, b) Dynamic Friction, c) Angle of Friction, d) Angle of repose. | Remember | 06 |
| B) A body is resting on a rough horizontal plane. The coefficient of friction between the body and the plane is 0.2 and the limiting friction force that is acting on the body is 80 N. Given that R is the resultant of the force of friction and the normal reaction force, find the magnitude of R. | CO2 | 06 |
| C) A Warren girder consisting of seven members each of 3 m length freely supported at its end points. The girder is loaded at B and C as shown. Find the forces in all the members of the girder, indicating whether the force is compressive or tensile. Use method of joints. | CO2 | 06 |

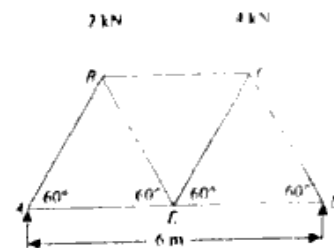


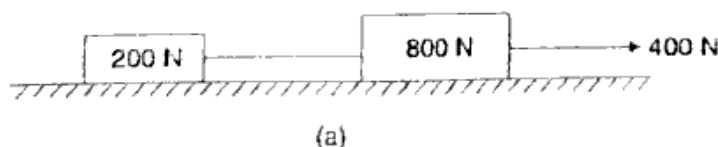
Fig 3.1 (C)

Q. 4 Solve any two of the following.

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|--|------|----|
| A) The equation of motion of an engine is given by $s = 2t^3 - 6t^2 - 8$, where (s) is in meters and (t) in seconds. Calculate (i) displacement and acceleration when velocity is zero; and (ii) displacement and velocity when acceleration is zero. | CO 5 | 06 |
| B) The horizontal component of the velocity of a projectile is twice its initial vertical component. Find the range on the horizontal plane, if the projectile passes through a point 20 m horizontally and 4 m vertically above the point of projection. | CO 4 | 06 |
| C) A Passenger train 500 m long, moving with a velocity of 108 kmph, overtakes a goods train moving on a parallel path in the same direction, completely in 45 seconds. If the length of the goods train is 250 m, Determine the speed of the goods train? | CO 4 | 06 |

Q. 5 Solve any two of the following. <https://www.batuonline.com>

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|--|------|----|
| A) 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 Fig. below. 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. | CO 5 | 06 |
|--|------|----|



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| B) A man wishes to move wooden box of 1 meter cube to a distance of 5 m with the least amount of work. If the block weighs 10 kN and the coefficient of friction is 0.3, find whether he should tip it or slide it. | CO 5 | 06 |
| C) A ball of mass 100 kg moving with a velocity of 20 m/s impinges directly on a ball of mass 200 kg at rest. The first ball, after impinging, comes to rest. Find the velocity of the second ball after the impact and the coefficient of restitution. | CO 5 | 06 |

*** End ***