PAPER ID—10711

Bachelor of Technology (Mechanical Engineering), Bachelor of Technology (Robotics and Automation) EXAMINATION, 2025

(Second Semester)

ENGINEERING MECHANICS

Time : 3 Hours   *Maximum Marks : 70*

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note :   Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal

marks.

1. (a) Define a force system and couple moment with examples.

   (b) State Lami's theorem.

   (c) A force of 20 N acts at a point. Calculate its moment about a point 3 m away.

   (d) Define relative velocity with an example.

   (e) Define polar moment of inertia.

   (f) Define shear force and bending moment.

   (g) State Newton's second law of motion with its mathematical form. $2 \times 7 = 14$
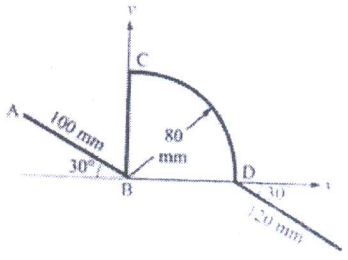
Unit I

2. Define moment of force about a point and show that the algebraic sum of the moments of two coplanar forces about a point is equal to the moment of their resultant about that point.   **14**

3. State and prove Lami's theorem.   14

Unit II

4. Locate the centroid of a wire bent as shown in below figure :   14

5. State and prove the perpendicular axis theorem. 14

Unit III

6. Derive the equations of motion for translation and rotation of a rigid body.   14

7. (i)   State Parallel axis Theorem.   4

     (ii)   Using the parallel axis theorem, determine the area moment of inertia of a rectangle

of width 4 m and height 6 m about its centroidal axis. **10**

Unit IV

8. Write the work-energy equation in case of fixed axis rotation. **14**

9. A projectile is fired with an initial velocity of 50 m/s at an angle of 30° with the horizontal. Find : **14**

   (a) Time of flight

   (b) Maximum height

   (c) Horizontal range.

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PAPER ID—10711

B. Tech. EXAMINATION, 2024

(Second Semester)

MECHANICAL ENGINEERING

Code : MEE-106

Engineering Mechanics

Time : 3 Hours   *Maximum Marks :* 70

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Note : Section A is compulsory. Attempt any *four* questions from Section B.

Section A

1. (i) Distinguish clearly between the resolution of forces and the composition of forces.

2

(ii) What are the different methods of studying the equilibrium of coplanar forces ? Describe any *one* of them. **2**

(iii) Define Lami's theorem. **2**

(iv) Describe Grubbler's equation for the perfect frame. **2**

(v) Define the perpendicular axis theorem. **2**

(vi) What is the significance of the radius of gyration ? **2**

(vii) Discuss work-energy equation. **2**

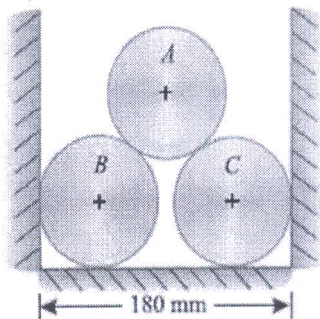## Section B

2. The following forces act at a point :

(i) 20 N inclined at 30° towards North of East.

(ii) 25 N towards North.

(iii) 30 N towards North-West

(iv) 35 N inclined at 40° towards South of West.

Find the magnitude and direction of the resultant force. **14**

3. Three cylinders weighting 100 N each and of 80 mm diameter are placed in a channel of 180 mm width as shown in Fig. Determine the pressure exerted by (i) the cylinder A on B at the point of contact (ii) the cylinder B on the base and (iii) the cylinder B on the wall. **14**

|← 180 mm →|

4. An I-section has the following dimensions in mm units :

Bottom flange = 300 × 100

Top flange = 150 × 50

Web = 300 × 50

Determine mathematically the position of the centre of gravity of the section. **14**

5. A railway coach, having ordinary cross-seats, is travelling at 4m/s. A person runs at 5m/s on the platform. In what direction, he must run so that he may enter the railway coach parallel to the seats? Also find the velocity with which he enters the coach. **14**

6. Explain the steps involved while making an analysis of a simple truss by the method of joint and method of section. Explain with the help of suitable example of truss. **14**

7. Draw S.F.D. and B.M.D. for a cantilever Beam carrying a uniform distributed load W N/m. Also find point of contraflexture. **14**

PAPER ID—10711

B. Tech. (ME/AE all ME)
EXAMINATION, 2023

(Second Semester)

ENGINEERING MECHANICS

Time : 3 *Hours*   *Maximum Marks* : 70

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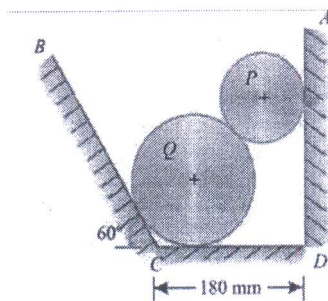
Section A

1. (a) Define static indeterminacy.   2
   (b) Explain Varingnon's principle of the moment.   2

(c)   Define the parallel axis theorem.   **2**

(d)   Differentiate between the center of mass and the center of gravity.   **2**

(e)   What is the significance of radius of gyration ?   **2**

(f)   Discuss the work-energy equation.   **2**

(g)   Explain the condition of equilibrium and its types.   **2**
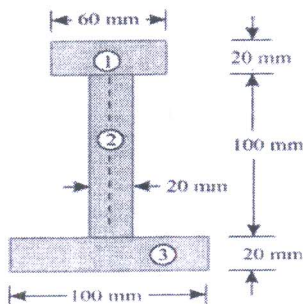
Section B

2.   A particle is acted on by three forces $2, 2\sqrt{2}$ and 1 KN. The first force is horizontal and towards the right, the second acts at 45° to the horizontal and inclined right upward, and the third is vertical. Determine the resultant of the given forces.   **14**

3.   Two cylinders P and Q rest in a channel as shown in Fig. The cylinder P has a diameter of 100 mm and weighs 200 N, whereas the cylinder Q has a diameter of 180 mm and weighs 500 N. If the bottom width of the box

is 180 mm, with one side vertical and the other inclined at 60°, determine the pressures at all four points of contact. **14**

4. An I-section is made up of three rectangles as shown in Fig. Find the moment of inertia of the section about the horizontal axis passing through the center of gravity of the section.

14

5. Explain the steps involved while making an analysis of a simple truss by the method of joint and method of section. Explain with the help of suitable example of truss. **14**

6. A motorist is driving at 80 km/hr on the curved portion of a highway of 40 m radius. He suddenly applies the brakes and decreases speed to 45 km/hr at a constant rate in 8 secs. Determine the tangential and normal components of acceleration :

   (a) immediately after the application of brakes

   (b) 4 seconds later. **14**

7. Draw S.F.D. and B.M.D. for a Cantilever Beam carrying a uniform distributed load W N/m. Also, find point of contraflexture. **14**

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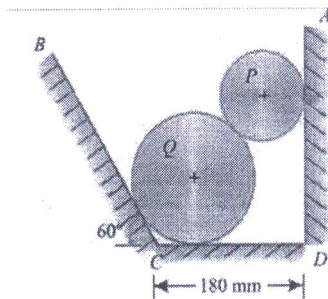
Section A

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    (b) Explain Varingnon's principle of the moment.   2

(c) Define the parallel axis theorem. **2**

(d) Differentiate between the center of mass and the center of gravity. **2**

(e) What is the significance of radius of gyration ? **2**

(f) Discuss the work-energy equation. **2**

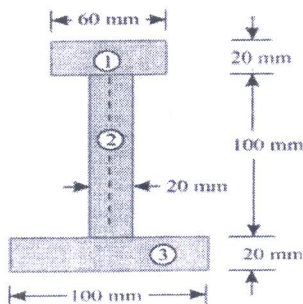(g) Explain the condition of equilibrium and its types. **2**

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