PAPER ID-312050

Roll No:

BTECH
(SEM III) THEORY EXAMINATION 2024-25
ENGINEERING MECHANICS

TIME: 3 HRS   **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.
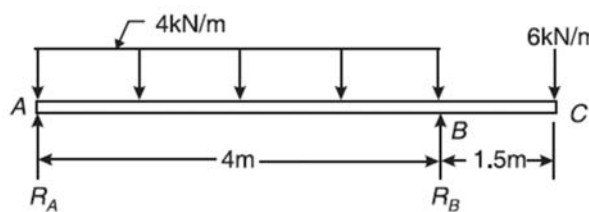
SECTION A

1. **Attempt *all* questions in brief.**   **2 x 07 = 14**

Q no.	Question	CO	Level
a.	What is the condition of equilibrium for two force system?	CO1	K2
b.	Define angle of friction.	CO1	K2
c.	Where does the centroid of a triangular plate lie?	CO2	K2
d.	What is Mass moment of inertia?	CO2	K2
e.	What is bending stresses?	CO3	K2
f.	Define the coefficient of restitution.	CO4	K2
g.	Define the terms collision of elastic bodies.	CO5	K2

SECTION B

2. **Attempt any *three* of the following:**   **07 x 3 = 07**

Q no.	Question	CO	Level
a.	Define and prove the principle of transmissibility of forces.	CO1	K3
b.	Derive an expression for moment of inertia of thin ring.	CO2	K3
c.	Find the support reactions as shown in fig.	CO3	K3
d.	What are the different types of potential energy and explain with suitable examples of each type.	CO4	K2
e.	What is the instantaneous center of rotation in plane motion? Explain with suitable examples.	CO5	K2

SECTION C

3. **Attempt any *one* part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Fig. shows a crank-lever ABC with a tension spring (T). The lever weighs 0.2 N/mm. Determine the tension developed in the spring, when a load of 100 N is applied at A.	CO1	K3
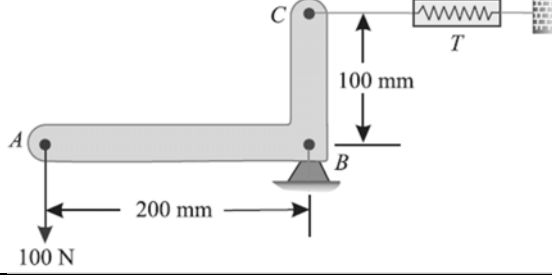
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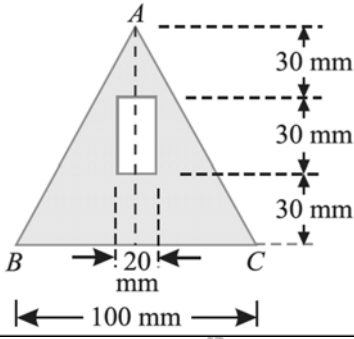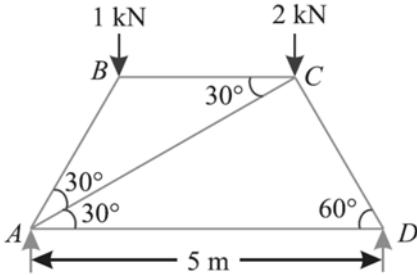|			
b.	The resultant of two forces, one of which is double the other, is 300 N. If the direction of the larger force is reversed and the other remains unaltered, the resultant reduces to 150 N. Determine the magnitude of the forces and the angle between them.	CO1	K3

4. **Attempt any *one* part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	A rectangular hole is made in a triangular section as shown in Fig. Determine the moment of inertia of the section about X-X axis passing through its center of gravity and the base BC.	CO2	K3
b.	State and prove the theorem of perpendicular axis applied to moment of inertia.	CO2	K3

5. **Attempt any *one* part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Fig. shows a framed structure of 5 m span. The structure carries vertical loads as shown in the figure. Find the forces in the members of the structure and tabulate the results.	CO3	K3
b.	Draw the B.M. and S.F. diagrams for the beam shown in Fig.	CO3	K3

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(a)
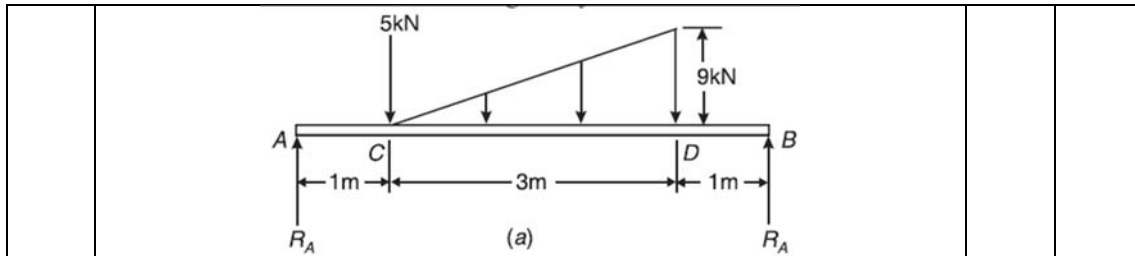
6.   **Attempt any _one_ part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	A wheel rotates for 5 seconds with a constant angular acceleration and describes during this time 100 radians. It then rotates with a constant angular velocity and during the next five seconds describes 80 radians. Find the initial angular velocity and the angular acceleration.	CO4	K3
b.	A ball impinges directly on a similar ball at rest. The first ball is reduced to rest by the impact. Find the coefficient of restitution, if half of the initial kinetic energy is lost by impact.	CO4	K3

7.   **Attempt any _one_ part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Differentiate between types of motion for rigid bodies, such as translational motion, rotational motion, and combined motion.	CO5	K2
b.	Explain the dynamic equilibrium of a rigid body in plane motion.	CO5	K2