PAPER ID-411518

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BTECH
(SEM I) THEORY EXAMINATION 2021-22
ELEMENTS OF MECHANICAL ENGG

Time: 3 Hours   *Total Marks: 70*

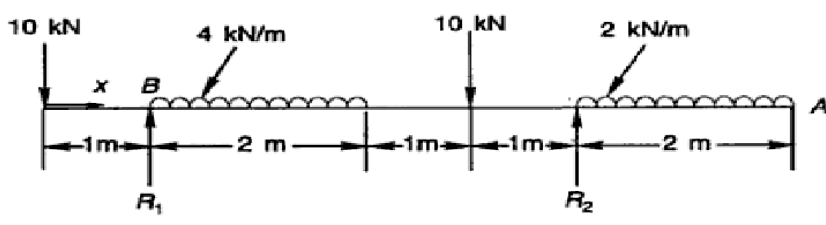**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 7 = 14**

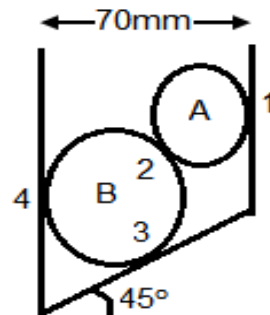|	
a.	What is static equilibrium? Write down sufficient condition of static equilibrium for coplanar and non-coplanar force system.
b.	Differentiate between centroid and center of gravity.
c.	Define brittleness and hardness.
d.	What do you understand by point of contraflexure?
e.	What is dryness fraction and wet steam?
f.	Why Carnot cycle is a theoretical cycle?
g.	Define state, path, and cycle of a thermodynamic process.

SECTION B

2.   **Attempt any *three* of the following:**   **7 x 3 = 21**

a.	State and prove parallel axis theorem.
b.	Draw the SFD and BMD for shown in **Fig.** Also find the point of contra-flexure if any.
c.	Draw the stress-strain diagram for ductile material under tension and discuss all the salient points.
d.	A reversible heat engine receives heat from two thermal reservoir at 870 K and 580 K, and rejects 50 kW of heat to a sink at 290 K. If the engine output is 85kW, make calculation for the engine efficiency and heat supplied by each reservoir.
e.	Explain Carnot cycle with the help of P-v diagram.

SECTION C

3.   **Attempt any *one* part of the following:**   **7 x 1 = 7**

a.	Two spheres A and B of weights 200N and 400N having diameters 30mm and 60mm respectively, are placed in a trench of width 70 mm as shown in **Fig.**. Determine the reactions at all the contacts.

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b.	Find Moment of Inertia of the given fig. about its centroidal axis.

4. **Attempt any *one* part of the following:** 7 x 1 = 7

a.	Draw SFD and BMD for simply supported beam shown in fig.
b.	Find out axial forces in all members of given truss

5. **Attempt any *one* part of the following:** 7 x 1 = 7

a.	Classify engineering materials and discuss the importance and selection of materials.
b.	A rectangular beam 250 mm deep and 300 mm wide is simply supported over a span of 8 m. What uniformly distributed load per meter the beam may carry, if the bending stress is not to exceed $120\,MPa$.

6. **Attempt any *one* part of the following:** 7 x 1 = 7

a.	Derive the efficiency of otto cycle with p-V diagram.
b.	Show that Internal Energy is the property of the system.

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

a.	With the help of diagram of Diesel cycle explain the working of 4 stroke diesel engine.
b.	Show the equivalence of Kelvin Planck and Clausius statements of 2nd law of thermodynamics.