CLASS: BTECH   SEMESTER: I
BRANCH: AI&ML/CS/EE/EC   SESSION: MO/2022

SUBJECT: ME101 BASICS OF MECHANICAL ENGINEERING

TIME: 2 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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			CO	BL

Q.1   Figure 1 shows a T-section of dimensions 10 × 10 × 2 cm. Determine the moment of   [5]   CO1   M
inertia of the section about the horizontal and vertical axes, passing through the center
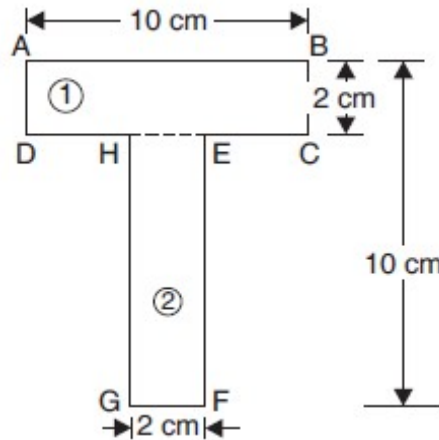of gravity of the section.

Figure 1.

Q.2   Two parallel walls, 8 m apart, are to be stayed together by a steel rod of 30 mm   [5]   CO1   L
diameter with the help of washers and nuts at the ends. The steel rod is passed through
the metal plates and is heated. When its temperature is raised to 90°C, the nuts are
tightened. Determine the pull in the bar when it is cooled to 24°C if
    (i)   the ends do not yield
    (ii) the total yielding at the ends is 2 mm

E = 205 GPa and coefficient of thermal expansion of steel α_s = 11 × 10^{-6}/°C

Q.3   A steam engine has a crank of radius 15 cm and connecting rod of length 75 cm as   [5]   CO2   H
shown in Figure 2. The crank CQ rotates in a clockwise direction with a constant speed
of 300 r.p.m. Calculate the velocity of the piston P at the instant when the angle θ =
30°. Also calculate the angular velocity of connecting rod.

Figure 2.

Q.4 The rod as shown in Figure 3 has a velocity 6 m/s vertically at point Q. Determine the angular speed of PQ, velocity of end P, and the velocity of middle point R of PQ. The length of the rod is 2.1 m. Use the method of instantaneous center. [5] CO2 M
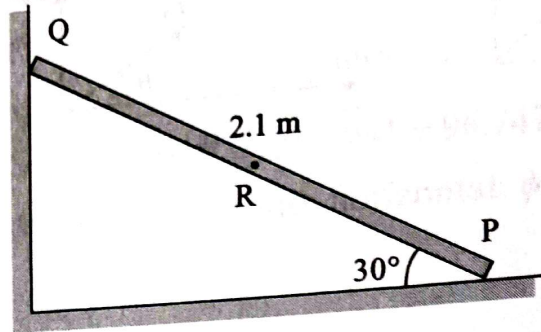

Figure 3.

Q.5 State the laws of friction. Also explain with a neat sketch the angle of repose. [5] CO3 L

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