Roll No. _____ **Total no. of Pages: [01]**

Total no. of Questions: [09]

B.Tech. (ECE/CSE) (Semester: 2nd)

ELEMENTS OF MECHANICAL ENGINEERING

Subject Code: BMEE0101

Paper ID: [110008]

Time Allowed: 3 Hrs. **Maximum Marks: 60**

Instructions to Candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(02 marks each)**

Q1. Attempt the following:

a) What is the concept of entropy?
b) Differentiate between refrigerator and heat pump.
c) Explain the term latent heat of steam.
d) Explain the term dryness fraction of steam.
e) Define polar moment of inertia?
f) Explain the first law of thermodynamics with respect to close systems.
g) State Coulomb Law of Friction.
h) What do you mean by relative efficiency?
i) Differentiate between centroid and centre of gravity.
j) Distinguish between Intensive and Extensive properties.

Section – B **(05 marks each)**

Q2. Explain the differences between a two-stroke cycle engine and a four-stroke cycle engine.

Q3. State and prove Clausius inequality.

Q4. Determine the maximum angle Θ in fig. 1 before the block begins to slip. μ_s = Coefficient of static friction between the block and the inclined surface.

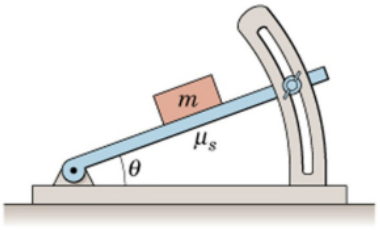


Fig. 1

Q5. State and proof Lami's theorem.

Q6. Find the moment of inertia of a rectangular section 30 mm wide and 40 mm deep about X-X axis and Y-Y axis.

Section – C **(10 marks each)**

Q7. 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 centre of gravity of the section.

Q8. a) State and explain Parallel axis theorem.
b) One kg of a gas at 240°C, expand adiabatically so that its volume is doubled and the temperature falls to 115°C. the work done during expansion is 89.96KJ. Calculate the two specific heats.

Q9. a) State Pascal's law and discuss its applications.
b) A stone weighs 4400 KN in air and when immersed in water it weighs 225 N. Calculate the volume of the stone and its relative density.