

21N509 /**B.Tech. II Sem (New Scheme) Main Exam Acad Session 2022-23****All Branch****(2FY2-09) - Elements of Mechanical Engineering****Time : 3 Hours****Maximum Marks: 70****Min. Passing Marks:****Instructions to Candidates:**

Part – A: Short answer questions (up to 25 words) $10 * 2$ marks = 20 marks. All 10 questions are compulsory.

Part – B: Analytical/Problem Solving questions $5 * 4$ marks = 20 marks. Candidates have to answer 5 questions out of 7.

Part – C: Descriptive/Analytical/Problem Solving/ Design questions $3 * 10$ marks = 30 marks. Candidates have to answer 3 questions out of 5.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

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1 _____

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PART-A

- Q.1. Differentiate between point function and path function.
- Q.2. Enlist the similarities between heat and work.
- Q.3. Define compression Ratio.
- Q.4. Draw P-V and T-S diagram for Carnot Cycle.
- Q.5. Draw a block diagram for the Brayton cycle and mention the function of each element.
- Q.6. Write industrial applications of the Rolling process.
- Q.7. How many atoms and molecules are there in 1 gram of Hydrogen.
- Q.8. Classification of IC engines.
- Q.9. Why is idler gear used in gear trains?

- Q.10. Determine torque transmitted on the pinion shaft if torque transmitted on the gear shaft is 20Nm. Consider Gear ratio = 4.

PART-B

- Q.1 A certain amount of an ideal gas initially at a pressure P_1 and temperature T_1 . First, it undergoes a constant pressure process 1 – 2 such that $T_2 = 3T_1/4$. Then, it undergoes a constant volume process 2 – 3 such that $T_3 = T_1/2$. The ratio of the final volume to the initial volume of the ideal gas is.
- Q.2. Difference between Reversible and Irreversible processes.
- Q.3. Write a short note on Brayton Cycle.
- Q.4. What is the difference between Otto, Diesel, and Dual cycle.
- Q.5. Write a short note on the Classification of Materials.
- Q.6. Classification of Gear Drives.
- Q.7. Write the difference between welding, brazing, and soldering.

PART- C

- Q.1. a) Write Kelvin-Planck and Clausius statements of the second law of thermodynamics with schematic diagrams.
- b) A cyclic heat engine operates between a source temperature of 1073 K and a sink temperature of 303 K. What is the least rate of heat rejection per kW net output of the engine?
- Q.2. Draw P-V and T-S Diagram for Diesel cycle and derive expression of the efficiency of Diesel cycle.
- Q.3. Write short notes on different types of Extrusion with a schematic diagram for each.
- Q.4. Prove that the ratio of belt tension is given by the $T_1/T_2 = e^{\mu \theta}$
- Q.5. Draw P-V and T-S diagrams for the Rankine cycle and derive the expression of the efficiency of the Rankine cycle.

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