S.No. : 827

BME 3102

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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 33502 Roll No. 1 2 2 0 4 3 2 6 2 5

B. Tech. Examination 2022-23

(Odd Semester)

BASIC MECHANICAL ENGINEERING

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : 8×1=8

   (a) Carburetor engines are now being replaced by MPFI engines. Comment. what is condition

   (b) What is entropy?

   (c) State the second law of thermodynamics.

   (d) Draw the P-V diagram of an Otto cycle.

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(e) Give the differences between a shaper and a planar.

(f) What is a fire tube boiler?

(g) What is a four-stroke SI engine?

(h) What is MPFI technology?

SECTION – B

2. Attempt any two parts of the following : 2×6=12

(a) Draw the P-V and T-S diagram of a Carnot cycle and explain the processes.

(b) Differentiate between fan, blowers and compressors.

(c) State the first law of thermodynamics for a process and cycle. Bring out the limitations.

(d) Explain the significance of Clausius inequality.

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each question. 5×8=40

3. (a) Derive the steady flow energy equation.

(b) Estimate the minimum power requirement of a heat pump for maintaining a commercial premises at 22 ^{0}C when environment temperature is –5 ^{0}C. The heat load on pump is 1×10^7 kJ/day.

(c) Explain the entropy princple and apply it to a closed system.

4. (a) Discuss the limitations of maximum and minimum temperatures in a steam power cycle.

(b) What do you understand by binary vapour power cycles?

(c) Compare 2-stroke SI engine with 4-stroke SI engines.

5. (a) Write short notes on the following :

(i) Brake power

(ii) Indicated power

(iii) Mechanical efficiency

(iv) Brake thermal efficiency

(b) What minimum volume of tank shall be required to store 8 Kmol and 4 kmol of O_2 and CO_2 respectively at 0.2 MPa, 27 ^{0}C.

(c) What is meant by real gas? Why ideal equation of state cannot be used for it?

6. (a) An engine with 90% mechanical efficiency has rating of 38 kW brake power. Estimate its indicated power and frictional power loss. Also determine the mechanical efficiency at quarter load assuming frictional power to remain same.

(b) Explain the reversible and irreversible processes.

(c) What is a Nozzle? Deriving from first princples prove that for the case of nozzle :

$$V_2\sqrt{2000\,(n_1 - n_1)}$$

Where the symbols have their usual meaning.

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(c) what are the heat pump and refrigerator