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

PAPER ID : 33504 Roll No. 1 2 1 0 4 3 2 2 1 4

B. Tech. Examination 2021-22

(Even Semester)

BASIC MECHANICAL ENGINEERING

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

Note :– (i) Attempt all questions.

(ii) Assume missing data, if any.

(iii) Symbols, sub-scripts ahve their usual meanings.

SECTION–A

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

(a) Define thermodynamics with example.

(b) State Zeroth's law of thermodynamics with esxample.

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(c) Write an example of isenthalpic process.

(d) Define third law of thermodynamics.

(e) What are condensers?

(f) What What is a monting?

(g) Define coefficient of performance.

(h) Write limitations of first law of thermo-dynamics.

SECTION – B

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

(a) Derive the expression for work done during polytropic process. Also discuss the case when n = 1.

(b) Prove that entropy is a property of system.

(c) Give a detail comparison of S. I. and C. I. engines

(d) Explain with the help of neat and clean diagram any one water tube boiler.

SECTION – C

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

3. (a) Define various types of system with example.

(b) Compare reversible and irreversible process. Also state the conditions for the process to be reversible.

(c) Explain on what principles thermometry is based upon?

4. (a) Prove the following :

$$C_v = \left(\frac{\partial u}{\partial T}\right)_v \text{ and } C_p = \left(\frac{\partial h}{\partial T}\right)_p$$

where the symbols have their usual meanings.

(b) What is a nozzle and diffuser? Prove that for nozzle and diffuser steady flow energy equation is given by :

$$h_1 = h_2 + \frac{V_2^2}{2} \text{ (for nozzle)}$$

$$h_2 = h_1 + \frac{V_1^2}{2} \text{ (for diffuser)}$$

where symbols have their usual meanings.

(c) Explain in detail with labelled diagram to Carnot cycle.

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5. (a) Explain the working of four stroke engine.

(b) Differentiate between 2S and 4S engine.

(c) What are boiler mountings and accessories? Explain any one boiler mounting in detail.

6. (a) Define COP of heat pump and refrigerator. Hence prove that :

$$[COP]_{H.P.} = [COP]_{Ref.} + 1$$

(b) Define any two of the following :

(i) Kelvin-Planck statement of second law of thermodynamics.

(ii) Clausius statement of second law of thermodynamics.

(iii) Entropy principle

(c) Prove that energy is a property of system.

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