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(2063)

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B. Tech 2nd Semester Examination

Basic Mechanical Engineering

BE-102

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note : (i) Candidates are required to attempt five questions in all selecting one question from each of the section A, B, C & D of the question paper and all the subparts of the questions in Section E. Use of non-programmable calculators is allowed.

(ii) Use of steam table, graphical plots are allowed.

SECTION - A

1. (a) Define the following terms:

(1) Internal Energy,

(2) Reversible Process

(3) Quasi-static Process

(4) Thermodynamic work

(5) Pure Substance. **(5×2=10)**

(b) State the first law of thermodynamics with its limitations. **(5)**

(c) Define a thermodynamic system. Differentiate between open system, closed system and isolated system. **(5)**

OR

2. (a) Give three examples to illustrate the applications of steady flow energy equation (S.F.E.E.) in engineering system. **(12)**

   (b) In a steam power station, steam flows steadily through a 0.2m diameter pipeline from the boiler to the turbine. At the boiler end, the steam conditions are found to be: p= 4MPa, t= 400 C, h = 3213.6 kJ/kg, and v =0.073 m^3/kg. At the turbine end, the conditions are found to be: p = 3.5 MPa, t = 392°C, h = 3202.6 kJ/kg, and v =0.084 m^3/kg. There is a heat loss of 8.5kJ/kg from the pipeline. Calculate the steam flow rate. **(8)**

SECTION - B

3. (a) What are statements of second law of thermodynamics? How is second law applicable to compressors and air receiver tanks? **(10)**

   (b) Draw neat sketch and name various parts of a refrigerator cycle. **(5)**

   (c) Differentiate between Heat Pump and Refrigerator. Also prove that (COP) Heat Pump - (COP) Refrigerator = 1. **(5)**

4. (a) Draw sketch of Heat Engine and Refrigerator using source and sink concepts. Also state relations for efficiency and COP. What is PMMII? **(6+3+3=12)**

(b) What are steam tables. Find the enthalpy, entropy, and volume of steam at 1.4 MPa, 380°C. **(8)**

SECTION - C

5. (a) Which is more effective way to increase the efficiency of a Carnot engine: to increase T_1, keeping T_2 constant; or to decrease T_2, keeping T_1 constant? **(10)**

(b) Draw and label two stroke petrol engine. Compare four stroke engine with two stroke engine. **(10)**

OR

6. (a) Explain the working of compression ignition engine. Why is the compression ratio of such an engine is more than that of spark ignition engine. **(10)**

(b) What is an air standard cycle. Why are such cycles conceived? **(5)**

(c) Explain the mixed or dual cycle. **(5)**

SECTION - D

7. (a) Explain the following terms:

(1) Specific volume of humid air

(2) Density of humid air

(3) Enthalpy of humid air

(4) Psycometery

(5) Degree of saturation **(5×2=10)**

(b) Explain the terms conduction, convection and radiation with suitable example. **(5)**

(c) Explain the concept of Newton's law of viscosity. **(5)**

OR

8. (a) Derive expression for Fouriers law of heat conduction. **(10)**

(b) What do you understand by the term air conditioning. Also explain dry bulb temperature, wet bulb temperature, dew point temperature, Daltons law of partial pressure and their relations. **(10)**

SECTION - E

9. (a) Define the term intensive and extensive property with examples?

(b) What do you mean entropy and enthalpy.

(c) What do you understand by dry bulb temperature and wet bulb temperature.

(d) What is dry saturated steam.

(e) What is Stefan-Boltzman constant.

(f) Define ton of refrigeration.

(g) What is Newton's Jaw of cooling,

(h) What do you mean surface tension,

(i) Define newtonian fluids. **(10×2=20)**