16027(J)   J-16

B. Tech 2nd Semester Examination

Basic Mechanical Engineering (NS)

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 : 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. Use of steam table, graphical plots are allowed.

SECTION - A

1. (a)   Derive steady flow energy equation (SFEE). Also give applications of steady flow energy equation.

                                                                (12)

    (b)   Explain with definition: Internal Energy, Irreversible Process, Enthalpy, Pure Substance.   (4×2=8)

OR

2. (a)   Derive expressions for the specific heat at constant pressure and constant volume.   (10)

    (b)   What are the modes in which energy is stored in a system?   (5)

[P.T.O.]

    (c)   What is PMMI? Why it is impossible?   (5)

SECTION - B

3. (a)   What 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)   Explain mechanical, thermal and chemical irreversibilities.
                                                                (5)

    (c)   What is a thermal energy reservoir? Explain the terms 'source' and 'sink' with suitable example.   (5)

OR

4. (a)   Define Carnot's principle and also find its efficiency.
                                                                (12)

    (b)   Define the following terms:

          (i)   Dry saturated steam

          (ii) Wet steam

          (iii) Superheated steam

          (iv) Dryness fraction   (4×2=8)

SECTION - C

5. (a)   Compare the Otto, Diesel and Dual cycle.   (10)

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

OR

6. (a)   What is spark ignition engine? What is air standard cycle of such an engine ? What are its four processes?   (12)

(b) With the help of P-V and T-S diagram show that for same maximum pressure and heat input

$\eta diesel > \eta dual > \eta otto$　　　　　　　(8)

SECTION - D

7. (a) Define the terms:

(i) Black body

(ii) Emissive power

(iii) Grey body

(iv) Psychometery

(v) Viscosity　　　　　　　($5\times2=10$)

(b) Derive expression for Fouriers law of heat conduction.
　　　　　　　(10)

OR

8. (a) Calculate; Relative humidity, Humidity ratio, Dew point temperature, Density and, Enthalpy of atmospheric air when DBT is 45°C and , WBT is 35°C and barometer reads 750 mm Hg.　　　　　　　(10)

(b) Explain Newton's law of viscosity.　　　　　　　(5)

(c) What is use of Psychometry charts?　　　　　　　(5)

SECTION - E

9. (a) Define ton of refrigeration.

(b) What do you understand by dry bulb temperature and wet bulb temperature?

(c) Define isothermal and adiabatic processes.

(d) What is the zeroth law of thermodynamics?

(e) What are point function and path function?

(f) What is Kelvin-Planck's statement?

(g) State Stefan Boltzman Law of radiation heat transfer.

(h) Why petrol evaporates more rapidly than water at ordinary temperature?

(i) Differentiate between centre of pressure and centre of buoyancy.

(j) Define Newtonian fluids.　　　　　　　($10\times2=20$)