*Roll No.*_____

SPECIAL END SEMESTER EXAMINATION
SEMESTER- III

COURSE CODE : ME 402 | **DURATION : 3 (THREE)HRS**
COURSE TITLE : Thermal Engineering - I | **MAXIMUM MARKS : 75**
SESSION : JULY-DEC'2021 | **PASS MARKS : 35 %**

NOTE:
1. *All the questions are compulsory*
2. *Attempt any 5 (five) questions.*
3. *Mark for each question is shown against it.*
4. *Assume suitable logical data wherever necessary.*

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1. **(a)** Differentiate between open system, closed system and isolated systems. Give at least two examples each. **(10)**

(b) Derive the expression for relationship between Centigrade and Fahrenheit scale of temperature. **(5)**

2. **(a)** State Boyle's law and Charles law. Hence deduce characteristic gas equation from these laws. **(9)**

(b) Determine the molecular weight of a gas. if its specific heats at constant pressure and volume are C_P = 2.286 kJ/kg and C_V = 1.768 kJ/kg K. **(6)**

3. **(a)** State first law of thermodynamics for a closed system. **(5)**
(b) State the Zeroth law statement. **(5)**
(c) State the limitations of first law of thermodynamics. **(5)**

4. **(a)** What is polytrophic process? Derive the expression for work done under polytrophic process. **(5)**

(b) Define : (i)Entropy (ii) Isochoric Process (iii)Isobaric Process (IV) Isothermal Process (V) Adiabatic Process. **(5)**

(c) One kg of air at 15° C and 98.1kPa is compressed isentropically to 588.6kPa. Determine the final temperature and work if the air is now cooled to 15° C at constant pressure. Find the heat exchanged. **(5)**

5. **(a)** An engineer claims to have developed an engine producing 4.5kW power when working between temperature limits of 1400° C and 350° C, consuming 0.5 Kg of fuel per hour with a calorific value of 4200 KJ/Kg, comment on the engineers claim. **(5)**

(b) With the help of neat sketch give constructional details and explain Cochrain boiler. **(10)**

6. **(a)** State the relation between two specific heats ($C_P - C_V = R$). **(7)**

(b) Calculate the change in entropy of an air if it is throttled from 5bar at 27^oC to 2bar adiabatically. **(8)**

7. **(a)** Define i) Latent Heat ii) Specific Heat iii) Temperature. **(6)**

(b) The working substance fir Carnot cycle is air, considered as perfect gas. Maximum **(9)**

pressure in the cycle is 20bar and temperature is 550 k. Ratio of isothermal expansion, the volume is 0.332 m^3. Determine i) Pressure and temperature at salient points ii) Thermal efficiency iii) M.E.P iv) Power developed with 100 cycles/min.

8. **(a)** Write short note on: **(5x3)**

i) Throttling process ii) Thermal Conductivity iii) Newton's law of cooling
iv) Kalvin-Planck's statement v) Homogenous and heterogeneous mixture.

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