Diploma Board Examination – December 2020

Course: Diploma in Mechanical Engineering.

Subject Name :   Heat Power Engineering.

Time: 2 Hours   Date: Sub Code: 32041   Max. Marks: 50

PART – A

Answer any FOUR questions   (4X2=8 marks)

1. How energy can be classified? Give examples.

2. What is meant by thermodynamic equilibrium of a system?

3. Define compression ratio and cut off ratio.

4. Mention the types of combustion chambers used in diesel engines.

5. List out the advantages of open cycle gas turbines.

6. Define enthalpy of wet steam and enthalpy of dry steam.

7. List out the various heat losses in a boiler.

8. What are the main features of high pressure boilers?

PART – B

Answer any FOUR questions   (4X3=12 marks)

9. A gas is compressed hyperbolically from the initial conditions of 80 KN/m^2 and 0.007 m^3 to a final pressure of $100KN/m^2$. Determine the final volume of the gas and work done on the gas.

10. An ideal hot air engine works on Carnot cycle between 100°C to 1000°C. Find the thermal efficiency of the engine. If the engine is supplied with 7200 kJ/min of heat energy, find the work done by the engine.

11. List out the factors affecting delay period.

12. Mention the advantages of turbo jet engines.

13. List out the applications of rockets.

14. Find the mass of 0.15m^3 wet steam at 9bar absolute and 0.8 dryness fraction.

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15. What are the safety precautions to be adopted during boiler operation?

16. 0.11m³ of a gas has a pressure of 138 kN/m². It is compressed to 690 kN/m² adiabatically. Determine the new volume of the gas, if $\gamma = 1.4$.

PART – C

Answer any THREE questions   *(3X10=30 marks)*

17. (a)   2.5 kg of gas with an initial volume 1.2m³ is cooled at constant pressure of 700 KN/m². The temperature at the end of cooling is 287°C. Determine: (i)The change in internal energy (ii)The change in enthalpy (iii)Heat transferred (iv)Work done and (v)Change in enthalpy Take R=0.32kJ/kgK and C_p =1.16 kJ/kgK.

18. (a)   A cycle consists of two isentropic processes and two constant volume processes. The compression ratio is 6. The pressure and temperature at beginning of compression are 1 bar and 35°C respectively. The maximum pressure of the cycle is 30bar. If air is the working fluid and the cycle is a theoretical cycle, determine the heat added and work done per kg of air. Also determine the thermal efficiency of the cycle.

19. (b)   Find the air standard efficiency of a diesel cycle engine if the cut off is 6% of the stroke and the clearance is $\frac{1}{13}$th of the stroke. Take $\gamma = 1.4$

20. (a)   A two stage single acting reciprocating air compressor takes in 15m³/min of air at 1bar and 18°C. The air is compressed to 7.5 bar. The intermediate pressure is ideal and inter-cooling is perfect. The compression follows the law $P.V^{1.3}$=constant and the compressor runs at 12 rps, neglecting clearance, determine (i)The intermediate pressure, (ii)The total volume of each cylinder and (iii)The cycle power.

21. (a)   Steam at a pressure of 8.5 bar absolute and 0.96dry is expanded to a pressure of 1.7 bar. Determine the final condition of steam and heat drop for each of the following methods of expansion. (i) Isentropic expansion and (ii) Throttling expansion.

22. (a)   Explain with a neat sketch the working of Lamont boiler and mention its demerits.

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