6244

BOARD DIPLOMA EXAMINATION
MARCH/APRIL - 2019
DIPLOMA IN MECHANICAL ENGINEERING
THERMAL ENGINEERING-I
THIRD SEMESTER EXAMINATION

Time: 3 Hours **Total Marks: 80**

PART - A (3m x 10 = 30m)

Note 1:Answer all questions and each question carries 3 marks

2:Answers should be brief and straight to the point and shall not exceed 5 simple sentences

1. Write the expressions for C_p and C_v in terms of R and γ
2. Define Temperature
3. Define Heat Pump
4. Represent the following processes on T-S diagram:
   a. Constant pressure process. b. Isochoric proces
5. Represent throttling process on P-V and T-S diagram
6. What is the effect of compression ratio on efficiency of Otto Cycle?
7. Write the Dulong's formula to find HCV of the fuel
8. What are the specific requirements of fuel injection system in compression ignition engines?
9. 1. Find the heat energy to exhaust gas using the following data

Temperature of Exhaust gas	=387.5°c
Temperature of engine room	=20°c
Air fuel ratio	=20
Specific heat of exhaust gas	=1.05 kJ/kg-°K
Fuel consumption	=0.128kg/min

10. Draw the theoretical indicator diagram for a single stage compressor

PART - B (10m x 5 = 50m)

Note 1:Answer any five questions and each question carries 10 marks

2:The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer

11. A steel cylinder of 50 litre capacity contains carbon dioxide at 18˚C and at a pressure of 120 bar. Calculate
(a) Mass of the gas,
(b) Density of the gas

12. A mass of an ideal gas has initial temperature of 16°C. If the temperature is raised to 280°C, find the change of internal energy and enthalpy. Assume specific heat at constant pressure is 1.065 kJ/kg°K and specific heat at constant volume is 0.718 kJ/kg°K

13. In a steady flow open system, a fluid substance flows at the rate of 10 kg/sec. It enters the system at a pressure of 600 kN/m^2 , a velocity of 150 m/sec with internal energy 2000 kJ/kg and specific volume of 1 m^3/kg. It leaves the system at a pressure of 125 kN/m^2, a velocity of 100 m/sec with internal energy 1600 kJ/kg and specific volume of 2 m^3/kg. During its passage through the system, the substance has a lost by heat transfer of 40 kJ/kg to the surroundings. Determine the power of the system, stating whether it is from or to the system. Neglect any change of gravitational potential energy

14. 2 kg of air at pressure of 875 kN/m^2 occupies a volume of 0.35 m^3. The air is then expanded to a volume of 2 m^3 at constant pressure. Find the work done and heat transfer during the process. Take R = 0.287 kJ/kg K and C_v = 0.717 kJ/kg K

15. In an ideal Ott cycle, the air at the beginning of isentropic operation is 1 bar and 15 The ratio of compression is 8. The heat added is 10008 kJ/k during constant volume proess. Take $\gamma : 1.4$ and C =0.714 kJ/kgK. Determine

    a. The maximum temperature in the cycle
    b. The air standard efficiency
    c. The work done per kg of air
    d. The heat rejected per kg of air

16. Explain with the help of line diagram, the working principle of simple carburettor

17. The following observations were made during a trial on two stroke engine for half an hour when it was running at 250 rpm
Stroke length=500 mm
Diameter =200 mm
Mean effective pressure=6 bar
Reading of spring balances=1390 N and 90 N
Mean circumference of brake drum=3600 mm
Fuel consumed=5.4 kg
Calorific value of fuel=44000 kJ/kg

Determine a) Mechanical efficiency b) Indicated thermal efficiency & c) Brake thermal efficiency

18. Air from an initial conditions of 25°C and 1 bar is compressed in two stages according to the law $pV^{1.25}$ = constant and with complete intercooling to a pressure of 36 bar. Estimate the minimum work required and intermediate pressure.

Assume C_p =1.05 kJ/kg°K and R = 0. 29 kJ/kg°K

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