417 Register No.:

April 2019

Time – Three hours
(Maximum Marks: 75)

[N.B: (1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory. Answer any FOUR questions from the remaining in each PART – A and PART – B

(2) Answer division (a) or division (b) of each question in PART – C.

(3) Each question carries 2 marks in PART – A, 3 marks in Part – B and 10 marks in PART – C.

(4) Use of Steam tables are permitted.]

PART – A

1. State Newton's second law of motion.
2. How the fuels are classified?
3. What is the latent heat of steam?
4. What are the requirement of steam condenser?
5. Why brake power is less then indicated power?
6. How air compressors are classified?
7. Mention the applications of air conditioning.
8. A refrigerating cycle working on reversed Carnot cycle has a COP of 4 and work done on compressor is 10kJ/s. Find the refrigerating effect.

PART – B

9. Derive general gas equation.
10. A gas is compressed hyperbolically from a pressure and volume of $105kN/m^2$ and $0.05m^3$ respectively to a volume of $0.005m^3$. Determine the final pressure and work done on the gas.
11. No engine can work on Carnot cycle. Why?
12. Draw the P-V diagram and T-S diagram of joule cycle and indicate the various processes.
13. How steam engines are classified?
14. State the difference between refrigerator and heat pump.

[Turn over....

15. What are primary refrigerants? Mention any two primary refrigerants.

16. A two stroke four cylinder petrol engine has a bore and stroke of 110mm and 140m respectively. The mean effective pressure is 600kN/m². If the engine speed is 1200rpm, calculate the power developed in the engine.

PART – C

17. (a) 0.35m³ of air at 22°C and under atmospheric pressure is heated at constant volume to a temperature of 100°C. Determine (i)Mass of air, (ii)The final pressure, (iii)The work done, (iv)The change in internal energy, (v)Heat transfer, (vi)The change in enthalpy and (vii)The change in entropy. Assume C_p=1.0 kJ/kgK and C_v=0.71 kJ/kgK.

(Or)

(b) 0.5kg of a gas occupies 0.3m³ at 20°C and 140 kN/m² and after adiabatic compression to 0.15m³, the pressure is 370kN/m². Find the value of gas constant and the two specific heats.

18. (a) Derive an expression for the air standard efficiency of diesel cycle.

(Or)

(b) A fuel contains 92% carbon, 4% hydrogen, 2% sulphur, 1.5% oxygen and 0.5% ash. It is supplied with 50% excess air. Determine the total air supplied and also gravimetric composition of the products of combustion.

19. (a) Determine the specific volume, enthalpy, entropy, external work and internal energy of 1kg of steam at 20bar and 250°C. Assume C_{ps}=2.1 kJ/kgK.

(Or)

(b) Explain with a neat sketch the working of locomotive boiler.

20. (a) With neat sketches, explain the working of a four stroke cycle diesel engine.

(Or)

(b) During a trial of four-stroke single cylinder oil engine, the following observations were recorded:

Duration of trial	- one hour
Fuel consumption	- 7.05 kg
Calorific value of fuel	- 44000 kJ/kg
Engine speed	- 210 rpm
Net load on brakes	- 1350 N
Brake drum diameter	- 1600 mm
Total mass of jacket cooling water	- 495 kg
Temperature rise of cooling water	- 38°C
Temperature of exhaust gases	- 300°C
Room temperature	- 20°C
Air consumption	- 311 kg
Specific heat of exhaust gases	- 1.004 kJ/kgK
Specific heat of water	- 4.1868 kJ/kgK

Draw up a heat balance sheet of the trial.

21. (a) With a neat line diagram, explain the working of a vapour compression refrigeration system.

(Or)

(b) With the help of a neat sketch, explain the working of a room air conditioner.
