318 Register No.:

April 2018

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. What is universal gas constant? State its value.
2. Define higher calorific value and lower calorific value of a fuel.
3. What is the use of Orsat apparatus? Name the chemicals used in it.
4. Differentiate wet steam and superheated steam.
5. State any two advantages of a condenser in steam power plant.
6. Define brake power and indicated power.
7. Distinguish between a refrigerator and a heat pump.
8. State Clausius statement of second law of thermodynamics.

PART – B

9. Find the volume of 2kg of air at STP.
10. State the requirements of a good fuel.
11. What are the uses of compressed air?
12. State the parts of a steam engine.
13. Explain the working of roots blower with a sketch.
14. Explain sensible heating and sensible cooling processes.
15. Draw the P-V and T-S diagrams of the diesel cycle and indicate various processes.
16. Explain the various stages in the formation of steam.

PART – C

17. (a) A quantity of air occupies a volume of 30 litres at a temperature of 38°C and a pressure of 104kN/m². The temperature of the air is raised by adiabatic compression until the volume becomes 6 litres. Find the final temperature, the external work done, the change in internal energy and the change in entropy. Take R=0.29kJ/kgK, ν=1.4.

(Or)

(b) A perfect gas is compressed according to the law $PV^{1.25} = C$, from an initial pressure of 1 bar and volume of 0.9m³ to a final volume of 0.6m³. Determine the final pressure and change in entropy per kg of gas during the process. Take R=287J/kgK, ν=1.4.

18. (a) What will be the loss in ideal efficiency of a diesel engine with the compression ratio of 14, if the fuel cut-off is delayed from 6% to 9% of the stroke?

(Or)

(b) Explain with a neat sketch the method to determine HCV and LCV of a gaseous fuel using gas calorimeter.

19. (a) Explain the working of BHEL high pressure boiler with a neat sketch.

(Or)

(b) (i) Explain the working of surface condenser with a neat sketch.
(ii) Explain the working of a single cylinder double acting reciprocating steam engine with a neat sketch.

20. (a) Explain the working of four stroke diesel engine with neat sketches.

(Or)

(b) During the test on a single cylinder, two stroke oil engine, the following data were obtained:

Cylinder bore	: 200 mm.
Stroke	: 250 mm.
Engine speed	: 300 rpm.

Net brake torque	: 500 Nm.
Indicated mean effective pressure	: 4.9 bar.
Fuel oil consumption	: 5 kg/hr.
Temperature rise of cooling water	: 55° C
Specific heat capacity of water	: 4.19 kJ/kgK.
Cooling water circulated	: 4 kg/min.
Calorific value of fuel oil	: 44,000 kJ/kg.

Calculate (i)Mechanical efficiency (ii)Specific fuel consumption. Draw up the heat balance sheet in kW.

21. (a) Explain the working of vapour compression refrigeration system with a neat sketch.

(Or)

(b) Explain the following with a neat sketch:

(i) Room air-conditioner.
(ii) Central air-conditioning plant.
