

**Time: 3 Hours**

**Max. Marks: 100**

**Instructions:**

1. **Group A** and **Group B** questions should be answered in the Main Answer book.
2. Answer any **TEN** questions in **Group A**. Each question carries two marks.
3. Answer **ALL** questions either **(a)** subdivision or **(b)** subdivision in **Group B**. Each question carries 14 marks.

**Group – A**

**Marks: 10 x 3 = 30**

1. What do you mean by thermodynamic system? State three types of thermodynamic systems?
2. State and explain zeroth law of thermodynamics.
3. Define the entropy change. State its significance.
4. Define air cycle and air standard efficiency.
5. Draw the p-V and T-s diagram of Carnot cycle and mention the various processes of the cycle.
6. Define: Compression ratio and cut-off ratio.
7. State the difference between S.I engine and C.I engine.
8. What is the function of piston rings used in I.C. engines?
9. Define calorific value of a fuel. State the difference between higher calorific value and lower calorific value of a fuel.
10. State the various stages in the formation of steam.
11. Define the following terms: Dryness fraction and wetness fraction.
12. What are the advantages of using a condenser in a steam turbine plant?
13. State any three industrial applications of compressed air.
14. Define: Ton of refrigeration and refrigeration effect.
15. Describe the term air conditioning.

**Group– B**

**Marks: 5 x 14 = 70**

16. a) A quantity of air occupies a volume of 30 litres at a temperature of 38°C and a pressure of 104 kN/m<sup>2</sup>. The temperature of 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, the heat transferred, the change in enthalpy and the change in entropy.

(or)

- b) 0.5 kg of air at 180°C expands adiabatically to 3 times of its original volume. During the expansion, the temperature is decreased to 20°C. Work done during the expansion is 53 kN-m. Find  $C_p$ ,  $C_v$  and R.

17. a) A compression ignition engine working on diesel cycle has the following data:

Cylinder bore - 150 mm

Stroke - 250 mm

Clearance volume - 400 c.c

The fuel injection takes place at constant pressure for 5% of the stroke. Find the air standard efficiency.

(or)

b) i) Explain the effect of compression ratio on thermal efficiency of an otto cycle and diesel cycle.

ii) Explain the three modes of heat transfer with suitable examples.

18. a) Explain the working principle of a four-stroke cycle petrol engine with neat sketches.

(or)

b) With a neat sketch, explain how the calorific value of a fuel is determined by using bombs calorimeter.

19. a) Explain with neat sketch, the working principle of impulse and reaction steam turbine.

(or)

b) What are the essential elements of steam condensing plant? Describe the working of a surface condenser with a neat sketch.

20. a) i) Describe the working of a centrifugal compressor with a neat sketch. (9)

ii) Compare gas turbine and IC Engines. (5)

(or)

b) Explain with a line diagram, the construction and working principle of a vapour compression system of refrigeration.

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