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C16–M–303

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BOARD DIPLOMA EXAMINATION, (C–16)

OCT/NOV—2017

DME—THIRD SEMESTER EXAMINATION

THERMAL ENGINEERING—I

Time : 3 hours] [*Total Marks* : 80

PART—A 10×3=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define thermodynamic system, surrounding and boundary. 1+1+1=3

2. State the terms involved in the equation :

$$C_p \quad \frac{.R}{1}$$

3. State the first law of thermodynamics and give mathematical expression.

4. 1 kg of air expands isothermally at a constant temperature of 127 °C. Find the work done if the initial pressure is 207 kN/m^2 and the final pressure is 69 kN/m^2. Assume R 0 287 kJ/kgK.

5. Draw the *P-V* diagrams for the following thermodynamics process :

(a) Isothermal process

(b) Adiabatic process

(c) Constant volume process

6. What is cut-off ratio pertaining to diesel cycle? Draw the *P-V* diagram for diesel cycle and show cut-off point on it.

7. Write any three advantages of multi cylinder engines over single cylinder engines.

8. Draw the valve timing diagram for 4-stroke petrol engine.

9. Define the terms mechanical efficiency and thermal efficiency pertaining to IC engines.

10. State any three advantages of multistage compression.

PART—B 10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. 2·5 kg of an idea gas is expanded from a pressure of 700 kPa and volume 1·5 m^3 to a pressure of 140 kPa and volume of 4·5 m^3. The change is internal energy is 500 kJ. Specific heat at constant volume for the gas is 0·719 kJ/kgK. Determine (a) gas constant and (b) initial and final temperatures. 10

12. Explain the folllowing with neat sketches : 5+5=10

(a) Quasi-static work

(b) Flow work

13. 0·12 m^3 of air at 1·5 MPa and 1500 °C expands adiabatically to 175 kPa. Find *(a)* the final temperature and *(b)* the work done. Take C_p 1 0035 kJ/kgK, C_v 0 7165 kJ/kgK. 10

14. Write steady flow energy equation (SFEE) and explain the terms involved in it. Discuss any two applications of SFEE with diagrams. 10

15. Explain various process of Carnot cycle with the help of *P-V* ant *T-S* diagrams and mention various assumptinos made in the analysis of Carnot cycle. 10

16. Explain the construction and working of 2-stroke petrol engine with neat sketch. 10

17. The following details refers to a four stroke engine :

Cylinder diameter = 220 mm
Length of stroke = 330 mm
Speed = 5 rev/second
Effectie brake load = 500 N
Mean circumstances of the brake drum = 4·5 m
IMEP = 5·6 bar

Calculate *(a)* indicaated power, *(b)* brake power and *(c)* mechanical efficiency. 10

18. *(a)* Explain the construction and working of a centrifugal compressor with a neat sketch.

(b) Write any four industrial uses of compressed air. 6+4=10

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