



C20-M-404

7457

**BOARD DIPLOMA EXAMINATION, (C-20)
OCTOBER/NOVEMBER—2023
DME – FOURTH SEMESTER EXAMINATION
HEAT POWER ENGINEERING—I**

Time : 3 Hours]

[Total Marks : 80

PART—A

3×10=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. List out the constituents of exhaust gases when a liquid fuel is burnt.
2. Define lower calorific value and higher calorific value of a fuel.
3. Distinguish between proximate and ultimate analysis of fuel combustion.
4. State the functions of fuel pump and fuel injector in diesel fuel system.
5. State the significance of heat balance sheet for testing of IC engine.
6. Define the terms (a) specific fuel consumption and (b) brake thermal efficiency.
7. Write down any three advantages of multistage compressor over single stage compressor.
8. Draw P-V diagram for a single stage reciprocating air compressor without clearance.
9. List the fuels used in jet propulsion.
10. Mention the advantages of gas turbine over IC engine.

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **eight** marks.
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (a) Explain the construction and working of Orsat apparatus.

(OR)

(b) The ultimate analysis of coal (by mass) is as follows :

C = 78%, H₂ = 4%, O₂ = 2%, S = 0.5 %, Ash = 10.5 % and moisture 5%. Calculate the mass of air to be supplied, if excess air supplied is 25%.

12. (a) Describe the working of a four-stroke petrol engine with legible sketches.

(OR)

(b) Explain any two methods of lubrication systems used in IC engines with the help of neat sketches.

13. (a) The following details refer to a four stroke engine :

Cylinder diameter	=	220 mm
Length of stroke	=	330 mm
Speed	=	5 rev/second
Effective brake load	=	500 N
Mean circumference of the brake drum	=	4.5 m
IMEP	=	5.6 bar

Calculate (i) indicated power, (ii) brake power and (iii) mechanical efficiency.

(OR)

(b) An engine working on Otto cycle has compression ratio of 8. The calorific value of the fuel used is 44000 kJ/kg. The brake thermal efficiency of the engine is 60% of air standard efficiency. Determine the specific fuel consumption in kg/kwh. Take adiabatic index, $\gamma = 1.4$.

14. (a) Find the minimum work required to compress one kg of air from 15 °C and 1 bar to 36 bar in two stage compressor. The law of compression is $PV^{1.25} = \text{constant}$, and intercooling is perfect. Characteristic gas constant, R for air is 0.287 kJ/kg K.

(OR)

- (b) Describe the working of axial flow type of compressor with a neat sketch.

15. (a) Draw a neat sketch of constant-pressure gas turbine and explain its working principle.

(OR)

- (b) Explain the working of turbojet engine with a neat sketch.

PART—C

10×1=10

- Instructions :** (1) Answer the following question.
(2) The question carries **ten** marks.
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. What is the necessity of cooling system in IC engines? Explain different methods of cooling IC engines with sketches.

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