17990

16117

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following: **20**

a) Write the equations for air standard efficiency of otto cycle and diesel cycle and state various terms involved in it.

b) Draw carnot cycle on P-V and T-S diagram.

c) Write use of compressed air.

d) What is pre-ignition? State any two factors responsible for pre-ignition.

e) An engine of diameter 225 mm and 350 mm stroke works on otto cycle. The clearance volume is 0.00263 m^3, find the air standard efficiency of cycle also sketch the cycle on p-v plane.

f) Draw actual valve timing diagram for 4 stroke petrol engine.

g) Compare S.I. and C.I. engines on the basis of:

(i) Basic cycle used

(ii) Compression ratio

(iii) Ignition method.

Marks

2. Attempt any TWO of the following: **16**

a) Compare reciprocating air compressor and rotary air compressor mentioning the basis of comparison (any eight points)

b) Explain the construction and working of screw compressor with a neat label sketch.

c) An I.C. Engine uses 6 kg of fuel having calorific value 44000 kJ/kg. in one hour. The IP developed in 18 kW. The temperature of 11.5 kg of cooling water was found to rise through 25°C per minute. The temperature of 42 kg of exhaust gas with specific heat 1 kJ/kg°K was found to rise through 220 °C. Draw the neat balance sheet for the engine.

3. Attempt any FOUR of the following: **16**

a) Explain with neat sketch turbo propeller w.r.t. jet propulsion.

b) Explain the concept of super heating and sub cooling with the help of p-h an T-S charts.

c) Name the different sensors used in ECU of modern automobile with their application. (Minimum four)

d) State the applications of gas turbine.

e) What is scavenging in I.C. engine? State it's types.

f) Draw constant pressure closed cycle gas turbine on P.V. and T-S plancs. Name the various processes involved and give it's efficiency equation with meaning of each term.

4. Attempt any FOUR of the following: **16**

a) State the norms of Bharat stage III and IV.

b) Explain MPFI with neat diagram.

c) What are the methods to improve thermal efficiency of gas turbine? Explain any one method.

d) Draw and explain battery ignition system.

e) Compare closed cycle and open cycle gas turbine.

f) A petrol engine working of constant volume cycle has compression ratio of 8 and consume 1 kg of air per minutes, if minimum and maximum temperature during cycle is 300°K and 2000°K respectively. Find power developed by engine. Assume $Y = 1.4$ and $Cv = 0.71$ kJ/kg°K.

Marks

5. Attempt any FOUR of the following: **16**

a) Define:

(i) Free air delivered

(ii) Compressor capacity

(iii) Swept volume

(iv) Pressure ratio w.r.t. compressor.

b) Draw a neat sketch of vapour compression refrigeration cycle. Describe it's working.

c) Define cutoff ratio, express in term of compression ratio and expansion ratio.

d) List any four applications of refrigeration.

e) Why does the carnot heat engine not exists in practice? Give any four points.

f) Ammonia refrigerator produces 1 ton of ice at –10°C from water at 20°C in 24 hrs. When 1 KWh energy is supplied. Find COP of refrigerator, take latent heat of ice as 335 kJ/kg and specific heat of ice 2 kJ/kg °K.

6. Attempt any TWO of the following: **16**

a) Explain construction and working of ice plant with neat sketch.

b) Explain with neat sketch diagram the working of 'Vapour Absorption Cycle'.

c) A pneumatic rock drill requires 10 kg/min of air at 6 bar pressure. Find the power required to drive the single acting single stage reciprocating compressor receiving air at 1 bar and 27°C. Assume mechanical efficiency as 80% and value of index, n as 1.25. Take Cp = 1.005 kJ/kg°K and Cv = 0.718 kJ/kg°K for air. Also estimate isothermal efficiency of compression.

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