Scheme - I

Sample Question Paper

Program Name	: **Diploma in Mechanical Engineering**
Program Code	: **ME**
Semester	: **Fifth**
Course Title	: **Power Engineering and Refrigeration**
Marks	: **70**

22562

Time : 3 Hrs.

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) Preferably, write the answers in sequential order.

(6) Use of psychrometry chart is allowed

Q.1) Attempt any FIVE of the following.   **10 Marks**

a) Name the Diagnostic Tools used for fault finding of MPFI Engine.

b) State the Unit of Refrigeration.

c) State the functions of Catalytic Converter.

d) Define the term "Compressor capacity'.

e) Name the essential components used in Gas turbine.

f) List the different Solid Propellant used in Rocket engine.

g) State the any two advantages of 'Turbo Charging'.

Q.2) Attempt any THREE of the following.   **12 Marks**

a) Represent Diesel Cycle on P-V and T-S Diagram.

b) State the effect of 'Air-Fuel Ratio' on exhaust emission.

c) Explain the working of 'Lobe type Air Compressor' with neat sketch.

d) Represent Brayton Cycle on P- V and T- S diagram.

Q.3) Attempt any THREE of the following.   **12 Marks**

a) List the Methods of reducing Pollution in diesel engine as per BS6 .

b) Explain the term

　　1. Octane Number

　　2. Knock Resistance

c) Explain with neat sketch the working of Household Refrigerator.

d) Differentiate between Two Stroke and Four Stroke I. C .Engine (any four points).

Q.4) Attempt any Three of the following.   **12 Marks**

    a) Explain the term "Exhaust Gas Recirculation' with neat sketch.

    b) Draw the labeled Valve Timing Diagram of typical 4- stroke Diesel Engine.

    c) Explain the concept of following terms with respect to refrigerants

        1.   GWP

        2.   ODP

    d) Explain the effect of clearance volume on multi stage Air compressor without intercooling by using P V diagram.

    e) Explain the working of 'Turbo Prop' with neat sketch.

Q.5) Attempt any TWO of the following.   **12 Marks**

    a) Following observations were recorded during a trial on single cylinder four stroke oil engine :

        Cylinder bore = 15 cm

        Length of stroke = 25 cm

        Mean effective pressure = 7.35 bar

        Engine speed = 400 rpm

        Brake torque = 225 N.m.

        Fuel consumption = 3 kg/hr

        Calorific value of fuel = 44200 kJ/kg

        Determine:

        i) Mechanical efficiency

        ii) Brake thermal efficiency

        iii) Brake specific fuel consumption

    b) A single stage reciprocating air compressor has swept volume of 2000 cm^3 and runs at 600 rpm. It operates on pressure ratio of 8 and clearance 5% of swept volume. Assume NTP room condition at inlet (P = 101.3kPa, T = 15°C) and polytropic compression and expansion with n = 1.25 calculate :

        i) Indicated power ii) volumetric efficiency iii) Mass flow rate iv) Isothermal efficiency

c) A simple saturation vapour compression cycle using R-12 is designed for 10 TR capacity. The vapour is dry saturated at the start of compression. For the 268° K evaporator temperature and 308° K condenser temperature, Represent process on P-H and T-S diagram

.Find: (i) Mass flow rate of refrigerant (ii) Power required in kW. (iii) C.O.P.

Given enthalpy values:

 (i) at the start of compression = 185 kJ/kg

(ii) at the end of compression = 206 kJ/kg

(iii) at the start of expansion = 70 kJ/kg

Q.6) Attempt any TWO of the following.   **12 Marks**

a) An IC engine uses 6 kg of fuel per hour having

CV of 43,000 kJ/kg.

The brake power developed is 21 kW.

The temperature rise of cooling water is 23˚C.

Rate of water flow is 11 kg/min.

The temperature rise of exhaust gas is 250˚C

Rate of flow of exhaust gases is 4.6 kg/min

specific heat of water 4.187 kJ/kg K

specific heat of exhaust gas are 1 kJ/kg K

 Prepare heat balance sheet on minute basis.

b) State the methods to improve efficiency of air compressor. Explain working of Two stage air compressor with perfect intercooling with the help of P-V diagram

c) The air is at 24 ˚C DBT and40 % Relative humidity.

With the help of psychrometric chart find following properties of air with units and plot the same on psychrometric chart.

(i) Dew point temperature (ii) Wet bulb temperature

(iii) SP volume of air (iv) Enthalpy of air (v) SP humidity of air

Scheme - I

Sample Test Paper - I

Program Name	**: Diploma in Mechanical Engineering**
Program Code	**: ME**
Semester	**: Fifth**
Course Title	**: Power Engineering and Refrigeration**
Marks	**: 20**

$$\boxed{\textbf{22562}}$$

Time : 1 Hour

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) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR.   **08 Marks**

   a. Name the different components of I C Engine

   b. List advantages of MPFI engine

   c. State the purpose of Piezoelectric injector

   d. Define term- BSFC

   e. State the effect of I C engine pollution on Environment

   f. Explain term ECU

Q.2 Attempt any TWO   **12 Marks**

   a. The following data is collected during a trial of four cylinder petrol engine.

      B.P. with all cylinder working = 15.8 kW

      B.P. with cylinder No. 1 cutoff = 11.14 kW

      B.P. with cylinder No. 2 cutoff = 11.2 kW

      B.P. with cylinder No. 3 cutoff = 11.36 kW

      B.P. with cylinder No. 4 cutoff = 11.3 kW

    Find mechanical efficiency of engine

   b. Explain with neat sketch the construction of Two Stroke Petrol Engine with neat sketch

   c. A four stroke petrol engine develops 5kW at 2000 R.P.M. When its mean effective pressure is 7.5 bar. If for the engine, L = 1.25 D, find its dimensions

Scheme - I

Sample Test Paper - II

Program Name	: Diploma in Mechanical Engineering
Program Code	: ME
Semester	: Fifth
Course Title	: Power Engineering and Refrigeration
Marks	: 20

$$\boxed{22562}$$

Time : 1 Hour

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) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR.   **08 Marks**

    a. Explain term- FAD w.r.t Air compressor

    b. List different types of Rotary Compressor

    c. List the applications of Gas Turbine

    d. Define – Comfort Air conditioning

    e. State the significance of Psycromentric Chart

    f. Name different Psycrometric Processes

Q.2 Attempt any TWO.   **12 Marks**

    a. A single stage reciprocating air compressor has swept volume of 2000 cm3 and runs at 600 rpm. It operates on pressure ratio of 8 and clearance 5% of swept volume. Assume NTP room condition at inlet (P = 101.3 kPa, T = 15 degree C) and polytropic compression and expansion with h = 1.25 calculate :

        i) Indicated power ii) Volumetric efficiency iii) Mass flow rate iv) Isothermal efficiency

    b. A refrigeration system works on vapour compression cycle. Enthalpies at various points are given below.

        Compressor inlet – 1460 kJ/kg.

        Compressor outlet – 1796 kJ/kg.

        Inlet to expansion valve – 322 kJ/kg.

        Calculate:

        (i) COP   (ii) Power required for 1 kg of refrigerant circulated per min.

The refrigerant is superheated by 15degree C before it enters the compressor and sub cooled by 3degree C before expansion. Sketch the cycle on p-h & T-S diagram.

c. List the methods to improve thermal efficiency of gas turbine and explain any one of themin detail.