17529

11819

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

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Answer ***each*** *next main question on a new page.*
(3) Illustrate your answers with ***neat*** *sketches* ***wherever*** *necessary.*
(4) Figures to the ***right*** *indicate* ***full*** *marks.*
(5) Assume suitable data, ***if necessary****.*
(6) ***Use*** *of Non-programmable Electronic Pocket Calculator is permissible.*
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
(8) ***Use*** *of Steam tables, logarithmic, Mollier's chart is* ***permitted****.*

Marks

1. A) Attempt **any three** of the following : **12**

a) Draw P-V and T-S diagram of Carnot cycle. Name the processes involved in it.

b) Define the terms for IC engine :
i) Mechanical efficiency ii) Indicated power

c) Define following terms w.r.t. compressor :
i) Pressure ratio ii) Swept volume

d) Enlist the advantages of multistaging of compressor.

B) Attempt **any one** of the following : **6**

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 working of non-dispersive infra red (NDIR) gas analyser.

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

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. When the rate of flow is 11 kg/min. The temperature rise of exhaust gas is 250°C, when rate of flow of exhaust gases is 4.6 kg/min specific heat of water and exhaust gas are 4.187 kJ/kg K and 1 kJ/kg K respectively. Prepare heat balance sheet on minut basis.

Marks

b) State the methods to improve efficiency of air compressor. Explain two stage air compressor with perfect intercooling.

c) Differentiate vapour compression and vapour absorption refrigeration system. (min. eight point of difference)

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

a) Differentiate between L-MPFI and D-MPFI system.

b) What are the effects of detonation in IC engine ?

c) Enlist the additives of lubricant used in SI engine and state their advantages.

d) Explain with neat sketch working principle of Turbo Jet Engine.

e) Define the following terms :

i) DBT ii) WBT iii) DPT iv) Relative humidity

4. A) Attempt **any three** of the following : **12**

a) State the effect of supercharging on S.I. engine with respect to following parameters :

i) Detonation ii) Combustion iii) Fuel economy iv) Quality of fuel

b) An engine has piston diameter 20 cm, length of stroke 50 cm and mean effective pressure 6 bar. Engine makes 120 power strokes per minut. Find mechanical efficiency if brake, power is 6 kW.

c) Differentiate between open cycle and closed cycle gas turbine.

d) Explain with neat sketch working principle of Ram jet engine.

B) Attempt **any one** of the following : **6**

a) Explain battery ignition in SI engine.

b) 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.

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

a) 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 = 101.3 kPa, T = 15°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) Explain with neat sketch construction and working of constant volume gas turbine.

c) Explain with neat sketch construction and working of ICE plant.

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

a) Explain four strokes of SI engine.

b) Explain with neat sketch working of screw compressor.

c) State different methods for improving thermal efficiency of gas turbine and explain regeneration method along with P-V and T-S diagram.

d) Enlist the four effects of subcooling on performance of VCC refrigeration cycle.

e) Draw neat sketch of window air conditioner and name the parts.