Total No. of Questions : 08]

SEAT No. :

P603

[Total No. of Pages : 3

[5869]-218
S.E. (Mechanical/Automobile) (Semester IV)
APPLIED THERMODYNAMICS
(2019 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Make suitable assumption whenever necessary.***
5) ***Scientific calculator is allowed.***

Q1) a) What is carburetor? Draw and explain working of simple carburetor. **[8]**

b) Explain the various stages of combustion in CI engine with the help of P-θdiagram **[9]**

OR

Q2) a) Enlist various sensors used in the Electronic Fuel Injection system. Draw and explain D-MPFI system. **[8]**

b) Draw P-θ diagram and explain the different stages of combustion in SI engine. **[9]**

Q3) a) Explain working of Rope Brake type of dynamometer with the help of neat sketch, also write Advantages and Disadvantages. **[9]**

b) The following observations were recorded during a test on 4 stroke single cylinder diesel engine. Bore - 250 mm, Stroke = 350 mm, Mean effective pressure = 0.65M^{pa} Brake drum diameter = 1.25m, Net brake load = 45 kg, Mean piston speed = 300 m/min, mf = 2.5 kg/hr, C.V of fuel = 41800 kj/kg. Find:

i) Friction power

ii) Mechanical efficiency

iii) Indicated and Brake thermal efficiency **[9]**

OR

P.T.O.

Q4) a) Define, write units and formula for following terms, **[8]**

i) Indicated power

ii) Brake Fuel specific consumption

iii) Brake Thermal efficiency

iv) Volumetric efficiency

b) In a test of an oil engine under full load condition, the results were obtained:
Brake torque = 327.5 Nm,
Fuel used = 15 kg/hr,
Frictional power = 10 kW, rpm = 1750,
Air supplied = 4.75 kg/min.,
Calorific value of fuel used = 42000 kj/kg,
Volume flow rate of cooling water = 14 lit/min,
Rise in temperature of cooling water = 45° C,
Exhaust gas temperature = 400° C,
Room temperature = 21° C,
Cpw = 4.2 kJ/kg K, Cpg = 1.23 kJ/kg K,
Find ISFC and draw the heat balance sheet on k W basis. **[10]**

Q5) a) Explain Magneto ignition system in details with diagram. **[8]**

b) State the objectives of supercharging of engine. Describe any one type of supercharger with neat sketch. **[9]**

OR

Q6) a) What are the various types of radiators used in cooling system of IC engine? Explain any one type of cooling system of IC engine with neat sketch. **[8]**

b) Explain battery ignition system in detail with neat sketch. **[9]**

Q7) a) Explain with neat sketch multi-stage reciprocating air compressor. And compare rotary compressor with reciprocating compressor. **[9]**

b) A reciprocating compressor has two stages with inlet air going into LP stage at 1 bar, 16° C and at the rate of 12 m3/min. Air is finally delivered at 7 bar and there is perfect intercooling at optimum pressure between the stages. The index for compression is 1.25 and compressor runs at 600 rpm. Neglecting clearance volume, determines intermediate pressure, total volume of each cylinder and total work required. **[9]**

OR

Q8) a) i) Give the classification of compressors? Define FAD and Volumetric Efficiency.

ii) How to improve isothermal efficiency of reciprocating air compressor. **[9]**

b) Two stage single acting air compressor takes in air at 1 bar and 300 K, Air is discharged at 10 bar. The intermediate pressure is ideal and intercooling is perfect. The law of compression is $PV^{1.3} = C$ Rate of discharge is 0.1 kg/sec. find:

i) Power required to drive the compressor

ii) Saving in work compared to single stage

iii) Isothermal efficiency for single and multistage. **[9]**

Take Cp = 1 kJ/kg.K, R = 0.287 KJ/kg.K