SEAT No. :

PB-3711

[6261]-120
S.E. (Mechanical & Automobile Engineering)
APPLIED THERMODYNAMICS
(2019 Pattern) (Semester - IV) (202048)

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) Explain the various engine variables influences abnormal combustion in SI engines. **[8]**

b) Classify fuel injection system used in CI Engines and explain working of Bosch fuel pump with neat sketch. **[9]**

OR

Q2) a) Draw p-θ diagram and explain the different stages of combustion in SI engine. **[8]**

b) What is ignition delay in CI engines? Explain any three factors affecting the ignition delay. **[9]**

Q3) a) During the trial of a single cylinder, four stroke oil engine, the following results were obtained: Cylinder diameter = 20cm, stroke = 40cm, mean effective pressure = 6bar, Torque = 407 Nm, Speed = 250 rpm, Fuel consumption = 4 kg/hr., C.V. of fuel = 43 MJ/kg, Cooling water flow rate = 4.5 kg/min, Air used per kg of fuel =30 kg of air / kg of fuel, rise in cooling water temperature = 45 °C, Temperature of exhaust gases = 420 °C, Room temperature = 20 °C, Mean specific heat of exhaustgas = 1 kJ/kg-K, Specific heat of water = 4.18 kJ/kg-K.Calculate, IP, BP and draw heat balance sheet for the test. **[10]**

b) Write short note on Indian Driving Cycle and European Driving Cycle.**[8]**

OR

P.T.O.

Q4) a) In a test of a four-cylinder petrol engine of 75mm bore and 100mm stroke, the following results were obtained at full throttle at a constant speed and with a fixedsetting of the fuel supply of 0.082 Kg/min. **[10]**

BP with all cylinder working = 15.24 kW,

BP with cylinder 1 is cut-off = 10.45 kW,

BP with cylinder 2 is cut-off = 10.38 kW,

BP with cylinder 3 is cut-off = 10.23 kW,

BP with cylinder 4 is cut-off = 10.35 kW,

Find,

i) Total indicated power of the engine,

ii) Total friction power and

iii) Indicated thermal efficiency of the engine if the CV of the fliel is 44MJ/Kg.

b) Define IP, BP and FP. Explain Willan's Line Method to find Friction Power. **[8]**

Q5) a) Explain with neat sketch pump assisted thermo-syphon water-cooling systems. Differentiate between air-cooling and water-cooling system.**[9]**

b) Explain with neat sketch wet sump lubrication system. Enlist the required property of a good lubricant. **[8]**

OR

Q6) a) Explain battery ignition system and state its advantages and disadvantages. **[9]**

b) What is turbocharging? Explain with neat sketch any one turbocharger. **[8]**

Q7) a) A single stage, single cylinder reciprocating air compressor delivers air at 6 bars. The rate of air taken in during suction is 12 kg/min. at 1.013 bar and 27°C. the compression take place with the index of 1.25. **[9]**

Calculate,

i) Work required for delivering 1 kg of air.

ii) Actual power required to run the compressor if $\eta_{mech} = 80\%$.

b) What is multi-stage compression? Justify it save power required for compression as compared to single stage compression. **[9]**

OR

Q8) a) A single acting single cylinder reciprocating air compressor has stroke volume 0.012 m^3 at 111rpm. The suction pressure and temperature are 1.013 bar and 27 °C respectively. The delivery pressure is 8 bar. **[9]**

Calculate,

i) Temperature after compression

ii) Compression work done required if compression is with index 1.4.

iii) Isothermal efficiency.

b) Give the classification of compressor? Differentiate between reciprocating and rotary compressor. **[9]**

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