Total No. of Questions : 8]

SEAT No. :

**PE4346**

[Total No. of Pages : 2

# [6582]-120
# S.E. (Automobile & Mechanical)
# APPLIED THERMODYNAMICS
## (2019 Pattern) (Semester - IV) (202048)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q.1 or Q.2 and Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***

***Q1)*** a) Explain any 3 combustion chambers used in SI Engine with neat sketch. **[9]**

b) List the various components of simple carburetor and explain the working of simple carburetor with neat labelled diagram. **[8]**

OR

***Q2)*** a) Explain any three of the following Solid Injection systems used in CI engines with neat block diagram. **[9]**

i) Individual pump and nozzle system
ii) Unit injector system
iii) Common rail system
iv) Distributor system

b) Difference between Detonation in SI and Knocking in CI Engine. (any eight points) **[8]**

***Q3)*** a) A 4-cylinder, 4-stroke engine 6cm bore and 9cm stroke was tested at constant speed fuel supply was fixed to 0.13 kg/min and plugs of 4-cylinder were successfully short circuited without change of speed;
The power measurement was as follows:
With all cylinder working = 16.25kW, With No. 1$^{st}$ cylinder cut-off = 11.55kW, With No.2$^{nd}$ – cylinder cut-off = 11.65 (B.P), with No.3$^{rd}$ -cylinder cut-off = 11.70 kW(B.P) With No. 4$^{th}$ cylinder cut-off =11.50 kW(B.P) **[10]**

Find

i) Indicated power
ii) Mechanical efficiency
iii) Indicated thermal efficiency if C.V. of fuel used is 42000 kJ/kg.

b) Explain briefly: **[8]**

i) Morsettest and
ii) Heat balance sheet

OR

***P.T.O.***

*Q4)* a) Explain briefly the Bharat stage norms and also explain the pollution norms adopted in Bharat stage 6 and give the numbers in tabular format for acceptable emission limits. **[9]**

b) Explain with the help of a need diagram exhaust gas recirculation system **[9]**

*Q5)* a) Write short note on water cooling system for IC engine and explain with neat sketch thermos syphon cooling system. **[9]**

b) Explain with neat sketch wet sump lubrication system. State any six differences between wet sump and dry sump lubrication system. **[8]**

OR

*Q6)* a) Explain with neat sketch working of battery ignition system? State any six differences between battery and magneto ignition system? **[9]**

b) Explain Bio-Diesel composition, production and its properties? **[8]**

*Q7)* a) Write the classification of compressors? Define FAD and Volumetric Efficiency? **[8]**

b) A single stage single acting air compressor delivers 0.6 kg of air per minute at 6 bar. The temperature and pressure at the end of suction stroke are 30ºC and 1 bar respectively. The bore and stroke of the compressor are 100 mm and 150 mm respectively. The clearance is 3% of the swept volume. Assuming the index of compression and expansion to be n = 1.3.

Find the following:

i) Volumetric efficiency

ii) Power required in mechanical efficiency is 85% and

iii) Speed of the compressor. **[10]**

OR

*Q8)* a) Short Note on **[8]**

i) Vane Type Compressor

ii) Roots Blower

b) A 2-stage, single acting reciprocating air compressor in 1 bar and 300K air is discharged at 10 bar 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 stage and multistage

take $C_p = 1$ kJ/kg.K, $R = 0.287$ kJ/kg.K **[10]**