BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING) THIRD YEAR FIRST SEMESTER-2024

INTERNAL COMBUSTION ENGINE　　　　**Time-Three Hours Full Marks-100**

Answer any FIVE questions. All questions carry equal marks.
Assume any data suitably, if necessary.

1.(a) Draw the Valve Timing diagram for a four-stroke vertical spark-ignition engine showing the positions of the opening and closing of each valve and also the point of sparking.　　　　10

(b) Why the suction valve opens before the TDC and closes after the BDC?　　　5
(c) Why the exhaust valve opens before the BDC and closes after the TDC?　　　5

2(a) Derive the expression of Thermal Efficiency of an air-standard Diesel Cycle showing the cycle on the (P-v) and the (T-s) planes.　　　　10
(b) In an Otto cycle air at 17 C and 1 bar is compressed isentropically to 15 bar.THeat is added at constant volume until the pressure rises to 40 bar.Calculate the air standard efficiency, the compression ratio for the cycle.Take C_v=0.717 kJ/kg K and γ=1.4　　　10

3(a) Draw a neat sketch of a simple downtake type float carburettor showing all its components in that sketch.　　　　5
(b) Based on the above sketch,derive the expression of Air-Fuel ratio of a carburettor in terms of the atmospheric pressure and the throat pressure considering air as a compressible fluid.　　　　15

4(a) Compare between the Otto cycle, Diesel cycle and Dual cycle based on same compression ratio and same heat addition.　　　　10
(b)A simple float type carburetor is required to supply 5 kg of air and 0.5 kg of fuel per minute.The air is initially at 1 bar and 300 K. The fuel has a specific gravity of 0.75. Calculate the throat diameter of the venturi for a flow velocity of 120 m/s.If the pressure drop across the fuel metering orifice is 0.80 of that of the venturi throat,calculate the orifice diameter.　　　　10

[Turn over

5(a) What are the basic requirements of a fuel injection system in a C I engine? Explain the different types of solid injection system for a CI engine.   10

(b) Calculate the diameter of the fuel orifice of a four-stroke engine which develops 25 kW per cylinder at 2500 rpm. The specific fuel consumption is 0.3 kg/kWh fuel with a fuel of specific gravity 0.876. The fuel is injected at a pressure of 150 bar over a crank travel of 25°. The pressure in the combustion chamber is 40 bar. Coefficient of velocity is 0.875 .

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6 . With a neat sketch explain the Battery-Ignition system used in a S.I engine.Also discuss the fundamental requirements of a spark ignition system.   20

7. Write short notes on (any two):   10+10
(a) Combustion comparison between an SI engine and a CI engine.

(b) Morse test.

(c) Four stroke engine vs Two stroke engine