

**B. MECHANICAL ENGINEERING (EVENING) 3<sup>RD</sup> YEAR 1<sup>ST</sup> SEMESTER 2017**

INTERNAL COMBUSTION ENGINES

Time -- Three hours

Full Marks – 100

Answer Any FIVE questions.

All questions carry equal marks

Assume suitable data, if at all necessary

Different parts of the same question are to be answered serially

- Q.1.a) Compare in tabular form between Two-Stroke Engines and Four-Stroke Engines. 10
- b) Draw the valve timing diagram for a Four-Stroke vertical high speed SI Engine. Explain why the exhaust valve opens before the BDC during the power stroke and closes after the TDC during the suction stroke. 5+5
- Q.2.a) In a S.I. engine working on the ideal Otto cycle, the compression ratio is 5.5. The pressure and temperature at the beginning of compression are 1 bar and 27<sup>0</sup>C respectively. The peak pressure is 30 bar. Determine the pressure and temperature at the salient points, the air-standard efficiency and the mean effective pressure. Assume ratio of specific heats to be 1.4 for air. 12
- b) A 42.5 kW engine has a mechanical efficiency of 85%. Find the indicated power and frictional power. If the frictional power is assumed to be constant with load, what will be the mechanical efficiency at 60% of the load? 08
- Q.3.a) With a neat labeled sketch, explain the working principle of a Simple Float type carburetor. 08
- b) Why rich fuel-air mixture is required during the 'idling range' and also during the 'high power range' of working of a simple float type carburetor. 12
- Q.4.a) A simple jet carburetor is required to supply 6 Kg of air and 0.6 Kg of fuel per minute. The fuel specific gravity is 0.75. The air is initially at 1 bar and 300K. Calculate the throat diameter of the choke for a flow velocity of 100 m/s. If the pressure drop across the fuel metering orifice is 0.80 of that of the choke, calculate orifice diameter assuming,  $\gamma=1.4$ . 12
- b) Discuss the effect of change in  $\gamma$  with temperature on the efficiency of the air standard Otto Cycle. 08
- Q.5.a) What are the factors for the selection of a fuel injection system in a CI engine. 08
- b) Explain the air-injection system and different types of solid injection system used in a CI engine with sketches. 12

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- Q.6.a) What are the differences of combustion in a CI engine and in a SI engine. 10
- b) Explain the phenomenon of 'Auto-ignition' in a SI engine. 10
- Q.7.a) A four cylinder engine running at 1200 rpm delivers 20 kW. The average torque when one cylinder was cut is 110 Nm. Find the indicated thermal efficiency if the calorific value of the fuel is 43 MJ/kg and the engine uses 360 grams of gasoline per kW h. 10
- b) Write short notes on i) crankcase scavenged two stroke engine, ii) octane number and cetane number. 5+5

X-X-X