Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, FEB-MAR 2021

SUBJECT: AUTOMOTIVE ENGINES AND SUBSYSTEMS [AAE 5171]

REVISED CREDIT SYSTEM
(26/02/2021)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.
- Draw sketches neatly using instruments.

1A. Define charge stratification. With a relevant sketch, Explain the constructional features and hence working principle of a multi-barrel carbureted and commercially applied stratified engine. **(03)**

1B. Discuss the effect of the following parameters on the performance of Dual fuel engines. (i) Inlet temperature (ii) Pilot fuel quantity (iii) Primary fuel used. **(03)**

1C. An eight- cylinder, four stroke engine of dimensions 90 mm x 80 mm with a compression ratio of 7:1 is tested at 4500 rpm on a dynamometer which has 54 cm arm. During a 10-minute test, the dynamometer scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44,000 kJ/kg. Air at 27^0 C and 1bar was supplied to the carburetor at a rate of 6 kg/min. Find the following. **(04)**
(i) Brake power (ii) Brake mean effective pressure (iii) Brake thermal efficiency (iv) Air fuel ratio.

2A. Illustrate the working principle of the sensor whose output is used by the engine management system for enriching the mixtures in petrol injection system engines under cold working conditions. **(04)**

2B. With a neat sketch, explain the working principle of a variable valve timing mechanism adapting the camshaft with dual profiles. **(03)**

2C. Find the velocity of air fuel mixture past a poppet valve of an engine having 150 mm bore and 200 mm stroke at 2100 rpm. If three intake valves per cylinder having a port diameter of 32 mm and a lift of 10 mm., which opens 10 degrees before TDC and closes 42 degrees after BDC and Coefficient of discharge = 0.6. Find the charge flow rate past the valve. **(03)**

3A. Discuss the reasons for the I C engine actual cycle efficiency being lower than the fuel air cycle efficiency. **(04)**

3B. With a neat sketch, illustrate the process of scavenging with CURTIS based port arrangement. **(03)**

3C. A down draught carburetor supplies 5.4 kg/h of fuel with A/F= 15.5:1. The fuel jet area=2 mm^2 with the coefficient of discharge of 0.75. If the tip of fuel jet is 6 mm above the fuel level and the venturi throat coefficient= 0.8, find the carburetor depression and the venturi throat diameter to cause this depression. **(03)**

4A. Find the pressure at the end of compression stroke if intake pressure is 1 bar; polytropic index =1.3 for a square engine of dimensions 80 mm, clearance vol=80 cc. Find the volume generated for every 45 degree of crank angle from TDC position for one full stroke length. Find the Compression Ratio of the engine. If the engine runs at 2000 rpm, if the length of the connecting rod is 120 mm, find the piston speed, acceleration at a crank position of 45^0 after TDC. **(04)**

4B. Discuss the constructional and features of (i) Aneroid Thermostat valve (ii) Full flow oil filter. **(03)**

4C. With a neat sketch, explain how the fuel delivery quantity is varied to meet the engine requirements in jerk pump fuel injection systems. **(03)**

5A. Illustrate how the efficacy of the charge induction can be improved by adapting the reed valve in the intake system. For which type of engines such a system is adaptable? **(04)**

5B. Define firing order in multi cylinder engines. Discuss the influence of the factors for the sale **(03)**

5C. An engine rated at 80 kW of output power has its thermal efficiency as 25%. Heat absorbed by coolant is 30% of heat supplied. How much heat should be dissipated from the heat exchanger of the automobile? The engine coolant is to be cooled in the heat exchanger from inlet temperature of 353K to ambient temperature of 25^0C. Estimate the quantity of coolant to be circulated for proper engine cooling. **(03)**