

**IANIPAL INSTITUTE OF TECHNOLOGY** 

## I SEMESTER M.TECH. (AUTOMOBILE ENGINEERING) END SEMESTER EXAMINATIONS, NOV 2017

## SUBJECT: AUTOMOTIVE ENGINES AND SUBSYSTEMS [AAE 5103] REVISED CREDIT SYSTEM (21/11/2017)

Time: 3 Hours

MAX. MARKS: 50

## Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.
- **1A.** What is scavenging? How does the loop flow scavenge system **(03)** work?
- **1B.** Illustrate the principle of working of an overhead cam valve **(03)** actuation system. Compare such systems with OHV systems.
- **1C.** What is economizer system in carburetors? How it is beneficial **(04)** for the engine operation?
- 2A. Explain the working principle of an individual pump fuel system (04) adapted for diesel engines and illustrate clearly how the fuel quantity is metered for different modes of operations.
- **2B.** What are valve timing diagrams? Define ram effect, exhaust blow **(03)** down, valve lead and lag with reference to such diagrams.
- 2C. A six-cylinder, gasoline engine operates on the four-stroke cycle. (03) The bore of each cylinder is 80 mm and the stroke is 100 mm. The clearance volume in each cylinder is 70 c c. At a speed of 4000 RPM and the fuel consumption is 20 kg/h. The torque developed is 150 N-m. Calculate (i) The brake power, (ii) The brake mean effective pressure, (iii) Brake thermal efficiency, if the calorific value of the fuel is 43000 kJ/kg and (iv) The relative efficiency if the ideal cycle for the engine is Otto cycle.
- 3A. Explain the principle of working of a hydrostatic thermostat valve. (03)
  What are the advantages of thermostat regulated pressurised liquid cooled systems in engines?

3B. An engine consumes 5 kg/h of fuel with A/F= 16. It uses a single (04) jet carburetor with fuel orifice area of 2 mm<sup>2</sup> and tip of nozzle jet is 5 mm above the level of petrol in float chamber.

Calculate (i) The depression in the venturi throat to maintain the required flow rate. (ii) The area of venturi is required to cause the carburetor depression. Specific gravity of fuel= 0.75, coefficient of discharge of fuel= 0.8. Density of air =  $1.2 \text{ kg/m}^3$  coefficient of discharge of air= 0.8.

- **3C.** With a neat sketch, explain the working of a lubrication oil pump **(03)** used in engines.
- **4A.** Discuss any five causes for the variation of actual engine cycle **(03)** efficiency when compared to ideal engines.
- **4B.** What is petrol injection? How are such systems classified? With **(04)** a neat sketch illustrate the features of a throttle body injection system.
- 4C. Output of an engine is 80 kW. Its Thermal efficiency is 25% and (03) heat lost to 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 353 K to ambient temperature of 298 K. Estimate the quantity of water/ coolant to be circulated for proper engine cooling.

- **5A.** Explain the working principle of Honda CVCC stratified charge **(04)** engine with a neat diagram.
- **5B.** With neatly labeled diagrams, differentiate between full flow and **(03)** by pass flow filter lubrication systems.
- **5C.** With a characteristic, discuss the working principle of an engine **(03)** coolant temperature sensor.