(b) A four stroke gas engine has a cylinder diameter of 25 cm and stroke 45 cm. The effective diameter of the brake is 1.6 m. The observations made in a test of the engine were as follows :

Duration of test	= 40 min
Total number of revolutions	= 8080
Total number of explosions	= 3230
Net load on the brake	= 90 kg
Mean effective pressure	= 5.8 bar
Volume of gas used	= 7.5 m^3
Pressure of gas indicated in meter	= 136 mm water of gauge
Atmospheric temperature	= 17ºC
Calorific value of gas	= 19 MJ/m^3 at NTP
Rise in temperature of jacket cooling water	= 45ºC
Cooling water supplied	= 180 kg

Draw up a heat balance sheet and estimate the indicated thermal efficiency and brake thermal efficiency. Assume atmospheric pressure as 760 mm of Hg. **7.5**

MAR-21-210052

B. Tech. EXAMINATION, March 2021

Semester IV (CBCS)

I.C. ENGINES (ME, AE)

ME-403

Time : 2 Hours   *Maximum Marks : 60*

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks.

Section A

1. (a) Derive an expression for the efficiency of the diesel cycle. **7.5**

(b) An oil engine works on Diesel cycle, the compression ratio being 15. The temperature at the start of compression is 17°C and 1700 kJ of heat is supplied at constant pressure per kg of air and it attains a temperature of 417°C at the end of adiabatic expansion. Find the air-standard efficiency of the cycle. What would be the theoretical work done per kg of air. Take $C_v = 0.717$ kJ/kg-K and $\gamma = 1.4$. **7.5**

2. (a) Discuss the various stages of normal and abnormal combustion in SI engine with a neat sketch. **7.5**

(b) Discuss the factors responsible for the delay period in compression ignition engine. **7.5**

Section B

3. (a) Mention the parts of simple carburetor with a neat sketch and discuss their functions. **7.5**

(b) What is GDI ? How does GDI system work ? Explain with a sketch. **7.5**

4. (a) Explain the working of exhaust turbocharging of a "V" type engine with a neat sketch. **7.5**

(b) What is Nozzle ? Discuss the functions fulfill by the nozzle. Mention the types of nozzle. **7.5**

Section C

5. (a) Discuss the dry sump lubrication system with a neat sketch. **7.5**

(b) What are the limitations of liquid cooling system ? Explain with a sketch evaporative cooling system. **7.5**

6. (a) A six cylinder, four stroke gasoline engine having a bore of 90 mm and stroke of 100 mm has a compression ratio 7. The relative efficiency is 55% when the indicated specific fuel consumption is 300 gm/kW-h. Estimate (i) the calorific value of the fuel and (ii) corresponding fuel consumption, given that imep is 8.5 bar and speed is 2500 rpm. **7.5**

(e) Differentiate between four-stroke petrol and diesel engine.

(f) Sketch the p-V diagram of 4-stroke petrol cycle.

(g) List out any *two* demerits of hydrogen fuel.

(h) List out few anti-knock agents added to the gasoline.

(i) Differentiate between physical delay and chemical delay with respect to the stages of combustion in diesel engine.

(j) Mention the factors responsible for the formation of oxides of nitrogen in diesel engine. **1.5×10=15**

Section D

7. (a) Explain the method of measurement of smoke by comparison method. **7.5**

    (b) Explain the internationally accepted methods of measuring the following invisible emission :

    (i) Unburned hydrocarbons

    (ii) Carbon monoxide. **7.5**

8. (a) Compare LPG and petrol as fuel for SI engines. **7.5**

    (b) What is Natural Gas ? What are the advantages and disadvantages of using natural gas as alternative fuels ? **7.5**

9. (a) What are the merits of using ethanol in SI engine ?

    (b) Sketch the valve timing diagram of 4-stroke gasoline engine.

    (c) What do you mean by rating of fuels ?

    (d) Differentiate between indicated mean effective pressure and brake mean effective pressure with respect of IC engine.