G.R. No. |

Paper Code – U228-153 (ESE)

MAY 2019/ENDSEM

S. Y. B. TECH. (MECHANICAL ENGINEERING) (SEMESTER - II)

COURSE NAME : INTERNAL COMBUSTION ENGINES

COURSE CODE : MEUA22173

(PATTERN 2017)

Time: [2 Hours]   [Max. Marks: **50**]

(*) Instructions to candidates:
1) Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8
2) Figures to the right indicate full marks
3) Use of Steam Table, Mollier Diagram is allowed
4) Use of scientific calculator is allowed
5) Use suitable data where ever required

Q.1 a) Explain with the help of a p – V diagram the loss due to variation of specific heats in an Otto cycle.   6

OR

b) A single cylinder four stroke diesel engine working on duel cycle has a compression ratio of 15 : 1. The engine draws in air at 1 bar, 27 °C and the maximum pressure in the cylinder is limited to 55 bar. If the heat transfer at constant volume is twice that at constant pressure, determine (i) the constant volume pressure ratio, (ii) the cut off ratio, and (iii) thermal efficiency of the cycle. Assume C_p = 1.005 kJ/kg K, C_v = 0.718 kJ/kg K, γ = 1.4.   6

Q.2 a) Why compensating devices are necessary for simple carburetor? Enlist the names of compensating devices used in simple carburetor.   6

OR

b) Write short note on capacitor discharge ignition (CDI) system.   6

Q.3 a) What are the basic requirements of good SI engine combustion chamber?   6

OR

b) Discuss the effect of the following engine variables on ignition lag in SI engine:
a) Fuel – air ratio
b) Compression ratio
c) Engine load   6

Q.4 **a)** Discuss the effect of the following engine variables on delay period in CI engine.

  a) Fuel – air ratio

  b) Compression ratio

  c) Engine load **4**

<center>OR</center>

b) Draw stages of combustion in a CI engine on indicator diagram **4**

Q.5 **a)** A two stroke diesel engine was motored when the meter reading was 1.5 kW. Then the test on the engine was carried out for one hour and the following observations were recorded:

Brake torque	= 120 Nm
Speed	= 600 rpm
Fuel used	= 2.5 kg
calorific value of fuel	= 40.3 MJ/kg
Cooling water used	= 818 kg
Rise in temperature of cooling water	= 10 °C
Exhaust gas temperature	= 345 °C
Room temperature	= 25 °C
A/F	= 32 : 1

6

Draw heat balance sheet in percentage.

b) A diesel engine consumes fuel at the rate of 5.5 gm/sec. and develops a power of 75 kW. If the mechanical efficiency is 85 %. Calculate break specific fuel consumption and indicated specific fuel consumption. The lower heating value of the fuel is 44 MJ/kg. **4**

c) Define following terms and write mathematical expression.

  (i) Break Power (bp)

  (ii) Break Thermal Efficiency (η_{bth}) **4**

<center>OR</center>

Q.6 **a)** A 4-cylinder, 4-stroke cycle engine having cylinder diameter 100 mm and stroke 120 mm was tested at 1600 rpm and the following readings were obtained.

Fuel consumption	= 0.27 lpm
Specific gravity fuel	= 0.74
B.P.	= 31.4 kW
Mechanical efficiency	= 80 %
Calorific value of fuel	= 44000 kJ/kg

Determine :

(i) break specific fuel consumption

(ii) indicated mean effective pressure, and

(iii) Brake thermal efficiency. **6**

b) A six-cylinder, four-stroke engine gasoline engine having a bore of 90 mm and stroke of 100 mm has a compression ratio 8. The relative efficiency is 60 %. When

the indicated specific fuel consumption is 3009 g/kWh. Estimate (i) The calorific value of the fuel and (ii) Corresponding fuel consumption given that indicated mean effective pressure is 8.5 bar and speed is 2500 rpm.   **4**

c) Define following terms and write mathematical expression.
    (i)   Indicated Mean Effective Pressure (bmep)
    (ii)   Indicated Specific Fuel Consumption (isfc)   **4**

Q.7
a) Write a short note on Emission control methods for SI and CI engines   **6**
b) Write a note on Bharat Stage - IV   **4**
c) What are different sources of air pollution form IC engine   **4**

OR

Q.8
a) Write a short note on harmful effects due to emission of IC engines.   **6**
b) Explain construction and working of catalytic converter   **4**
c) Write a note on alternative fuels used for IC engine   **4**

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