

Total No. of Questions – [8]

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DECEMBER 2019/ENDSEM Backlog Exam

**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) Compare Otto, Diesel and Dual cycle with the help of  $p - V$  and  $T - s$  diagram for same maximum pressure and heat addition. 6

OR

- b) A high speed diesel engine working on ideal dual combustion cycle takes in air at a pressure of 1 bar and temperature of 50 °C and compresses it adiabatically to 1/14 of its original volume. At the end of compression the heat is added in such a manner that during the first stage the pressure increases at constant volume to twice the pressure of the adiabatic compression, and during the second stage following the constant volume addition, the volume is increased twice the clearance volume at constant pressure. The air is then allowed to expand adiabatically to the end of the stroke where it is exhausted; heat is being rejected at constant volume.

Calculate

- (i) the temperature at the key points of the cycle,
- (ii) the ideal thermal efficiency.

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- 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 battery ignition system. 6

- Q.3 a) Draw any three sketches of combustion chamber designs for SI engine. 6

OR



- b) Discuss the effect of the following engine variables on ignition lag in SI engine:
- (i) Fuel – air ratio
  - (ii) Compression ratio
  - (iii) Engine load

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- Q.4 a) Discuss the effect of the following engine variables on delay period in CI engine.
- (i) Fuel – air ratio
  - (ii) Compression ratio
  - (iii) Engine load

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OR

- b) Draw any two sketches of combustion chambers used in CI engine.

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- 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

Draw heat balance sheet in percentage.

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- b) A gasoline engine works on Otto cycle. It consumes 8 litres of gasoline per hour and develops power at the rate of 25 kW. The specific gravity of gasoline is 0.8 and its calorific value is 44000 kJ/kg. Find the indicated thermal efficiency of the engine.

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- c) Define following terms and write mathematical expression.

- (i) Break Power (bp)
- (ii) Break Thermal Efficiency ( $\eta_{bth}$ )

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OR

- 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.

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- b) A gasoline engine is specified to be 4-stroke and four-cylinder. It has a bore of 80 mm and a stroke of 100 mm. On test it develops a torque of 75 Nm when running at 3000 rpm. If the clearance volume in each cylinder is 60 cc the relative efficiency with respect to brake thermal efficiency is 0.5 and the calorific value of the fuel is 42 MJ/kg; determine the fuel consumption in kg/hr. and the brake mean effective pressure.

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- c) Define following terms and write mathematical expression.

- (i) Indicated Power (ip)
- (ii) Mechanical Efficiency ( $\eta_{\text{mech}}$ )

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- Q.7 a) Write a short note on Emission control methods for SI and CI engines
- b) Explain construction and working of catalytic converter
- c) Write a note on alternative fuels used for IC engine

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OR

- Q.8 a) Write a short note on harmful effects due to emission of IC engines.
- b) Write a note on Bharat Stage – IV
- c) What are different sources of air pollution form IC engine

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\*\*\*\*\*Best of Luck\*\*\*\*\*