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## OLE-24260

### B. Tech. 5th Semester (ME) Examination – April, 2021

#### INTERNAL COMBUSTION ENGINES AND GAS TURBINES

Paper : ME-307-F

*Time : Three Hours ]*

*[ Maximum Marks : 100*

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*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

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**Note :** Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Draw the PV and TS diagram of Otto cycle. 4
- (b) Define the working of catalytic converter and show by way of figure where it is place. 4
- (c) Write short note on stages of combustion in S.I. Engines. 4

- (d) Explain the Euro-VI norms for pollution. 2
- (e) What is cetane number of petrol ? 2
- (f) What is volumetric efficiency ? Explain. 4

### **SECTION – A**

2. (a) State the essential requirement of a diesel injection system. 10
- (b) Derive an expression for the calculation of air fuel ratio for the carburetor. 10
3. An engine working on Dual cycle takes air at 1 bar and 20°C. The maximum pressure of the cycle is limited to 70 bar. The compression ratio of the engine is 15. Find out air standard efficiency and MEP of the cycle. Assume heat added at constant volume is equal to heat added at constant pressure. 20

### **SECTION – B**

4. What is lubrication ? Mention its types. Explain with suitable examples. 20

5. (a) Explain the combustion stages of C. I. engines. 10  
(b) Name various theories of detonation. Explain the Pre-Ignition with neat sketch. 10

### SECTION – C

6. A two stroke diesel engine was motored when meter reading was 1.5 kW. Then the test on the engine was carried out for one hour and following observations were recorded. 20

- (i) Brake torque = 120 Nm
- (ii) RPM = 600
- (iii) Fuel used = 2.5 kg
- (iv) C. V. of fuel = 40.3 MJ/kg
- (v) Cooling water used = 818 kg
- (vi) Rise in cooling water temperature = 10°C
- (vii) Exhaust gas temperature = 345°C
- (viii) Room temperature = 25°C
- (ix) A : F used = 32 : 1.

Take  $C_{cg} = 1.05 \text{ kJ/kg.K}$

Determine :

- (a) B. P., I. P. and mechanical  $\eta$  and indicated thermal  $\eta$
  - (b) Draw up heat balance on minute and percentage basis. 20
7. (a) Explain briefly the current scenario of the pollution in India due to vehicles. 10
- (b) Explain different categories of SI emissions. Also explain various factors affecting exhaust emission. 10

### SECTION – D

8. (a) What is Degree of reaction ? Discuss. 10
- (b) Define slip factor and drive an expression for the same. 10
9. Explain the methods that can adopted for improvements of the basic gas turbine cycle. 20