

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE- SEMESTER-VI (NEW) EXAMINATION – WINTER 2024**

**Subject Code:2161902**

**Date:25-11-2024**

**Subject Name:Internal Combustion Engines**

**Time:02:30 PM TO 05:00 PM**

**Total Marks:70**

**Instructions:**

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

	<b>MARKS</b>
<b>Q.1</b> (a) Why Otto cycle is called constant volume cycle?	<b>03</b>
(b) Explain the following terms as applied to IC Engine: (i) Bore (ii) Stroke (iii) TDC (iv) Swept Volume	<b>04</b>
(c) What do you mean by IC Engine? How they are classified?	<b>07</b>
<b>Q.2</b> (a) Give justification for the following: (i) IVO before TDC (ii) IVC after BDC.	<b>03</b>
(b) Discuss briefly blowdown losses as applied to I.C. engines.	<b>04</b>
(c) Explain with suitable sketch different methods of supercharging.	<b>07</b>
<b>OR</b>	
(c) Explain construction and working of simple carburettor with neat sketch.	<b>07</b>
<b>Q.3</b> (a) What is difference between actual cycle and fuel air cycle for CI Engines?	<b>03</b>
(b) List advantages and limitations of pulse turbocharging.	<b>04</b>
(c) Explain briefly Exhaust Gas Recirculation for IC Engines.	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Define the following term: (i) Octane number (ii) Cetane number	<b>03</b>
(b) Describe the cause of HC emissions from SI and CI engines.	<b>04</b>
(c) Explain the working of Bomb Calorimeter with neat sketch.	<b>07</b>
<b>Q.4</b> (a) What is ignition advance in SI Engine? Why it is necessary in ignition system?	<b>03</b>
(b) Explain with neat sketch splash lubrication system.	<b>04</b>
(c) With the help of P- $\theta$ diagram, explain the different stages of combustion in Spark-ignition engines.	<b>07</b>
<b>OR</b>	
<b>Q.4</b> (a) Discuss the function of a lubricant in an engine.	<b>03</b>
(b) Explain briefly the pressurized water cooling method.	<b>04</b>
(c) What do you mean by ignition delay? How does it affect the knocking tendency in a CI engine?	<b>07</b>

- Q.5 (a)** What are the advantages of diesel power plant over steam power plant? **03**
- (b)** Draw neat sketch of pintaux nozzle and discuss its merits. **04**
- (c)** The following observations were made during a test on diesel engine: **07**  
 BP = 32 kW  
 $m_f = 10 \text{ kg/hr}$   
 Flow rate of cooling water = 530 kg/hr  
 Rise in temperature of cooling water =  $50^\circ\text{C}$   
 CV of fuel = 44000kJ/kg  
 A:F = 20:1  
 Ambient temperature =  $20^\circ\text{C}$   
 Exhaust gases are passed through an exhaust gas calorimeter. Flow rate of water through calorimeter is 450kg/hr and its temperature rise by  $40^\circ\text{C}$ . The exhaust gas leaves the calorimeter at  $90^\circ\text{C}$ . Prepare a heat balance sheet on minute and percentage basis.  
 Take:  $C_p(\text{water}) = 4.2 \text{ kJ/kg.K}$  &  $C_p(\text{exhaust gas}) = 1.005 \text{ kJ/kg.K}$

**OR**

- Q.5 (a)** What is Willan's line method? For which type of engine it is applicable? **03**
- (b)** Give the basic comparison between battery ignition and magneto ignition system. **04**
- (c)** A four cylinder four stroke engine have 10cm bore and 14cm strokes runs at 4000rpm. A:F ratio supplied to engine is 16:1 with volumetric efficiency of 75%. Manometer shows reading of 12cm of mercury causing the air flow through the ventury. Find diameter of ventury and nozzle orifice. Neglect the compressibility of air. **07**  
 Take:  $C_{da} = 0.85$ ,  $C_{df} = 0.75$ ,  
 $\rho_a = 1.25 \text{ kg/m}^3$ ,  $\rho_f = 750 \text{ kg/m}^3$ ,  $\rho_{\text{mercury}} = 13600 \text{ kg/m}^3$

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