

PRN No.	
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PAPER CODE	U315-2114 (ESE)
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(AY:2025-26) December 2025 (ENDSEM) EXAM

TY (SEMESTER - I)

COURSE NAME: I C Engine &amp; Alternative Fuels Branch: Mechanical COURSE CODE: ME31234A

TY (PATTERN 2023)

Time: [1Hr 30 Min]

[Max. Marks: 40]

(\*) Instructions to candidates:

- 1) Figures to the right indicate full marks. Use of scientific calculator is allowed
- 2) Use suitable data wherever required
- 3) All questions are compulsory. Solve any two sub question each from Questions 1 and 2
- 4) Solve any one sub question (2 marks) from Questions 3 ,4 ,5 and 6 and sub question of 4 marks is compulsory from questions 3,4,5,and 6

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Explain the assumptions in air standard cycle.	[4]	1	2
	b) Discuss the Homogeneous and Heterogeneous mixtures and type of combustion applicable.	[4]	1	2
	c) Describe the actual PV diagram of otto cycle (SI Engine)	[4]	1	2
Q2	a) With help of P-theta diagram describe first 3 combustion stages of SI engine	[4]	2	2
	b) Explain any four factors that increase Flame speed in SI engine.	[4]	2	2
	c) Use chemical correct air fuel ratio concept and calculate Stoichiometric air fuel ratio for fuel consist of 90% NG and rest is Hydrogen.	[4]	2	2
Q3	a) Demonstrate effect of speed and temperature on volumetric efficiency.	[2]	3	2
	OR	[2]	3	2
	b) "A fuel with high octane number is not suitable for CI engine" Discuss	[4]	3	3
Q4	c) 4-cylinder 4 stroke CI engine has a bore of 9 cm and stroke 11 cm. Its rated speed is 3500 RPM and it is tested at this speed against a torque of 75 Nm. Estimate BMEP			
	a) The Brake Power is 10 kW, mass of fuel consumed is 2.1 kg/hr, CV of fuel is 56000 kJ/kg. Determine Brake thermal efficiency.	[2]	4	3
	OR			
	b) The Frictional power at a speed of 2500 rpm at 4.43 kW is 0.25 kw. The same engine was working at 3.85 kW at same speed. Calculate Indicated Power	[2]	4	3

	c) During a test on 4 stroke diesel engine following data were recorded IP= 25 kW, Load applied on Dynamometer= 75 kg, Dynamometer arm length= 0.70 m, Speed = 6 rev/sec, Fuel consumed = 0.002 kg/sec, mass water circulated for engine cooling = 0.135 kg/sec, Specific heat of water= 4.187 kJ/kg K, Initial and Final temperature of water are 27 and 65 degrees respectively. Estimate the Mechanical efficiency, heat lost to water.	[4]	4	3
Q.5	a) Demonstrate the effect of E10 and E20 fuel on brake power and thermal efficiency wrt speed (Diagram only). OR	[2]	5	1
	b) Compare the CO <sub>2</sub> , NO <sub>x</sub> emission level in CNG Vehicle with pure petrol. (Diagram only)	[2]	5	1
	c) The four stroke SI engine working at 2400 RPM develops a brake power of 18 kW at BSFC of 0.21 kg/kW-hr . When same engine is retrofitted to use CNG as fuel, at same RPM its brake power and bsfc (value) decreased by 20 %. Evaluate the mass of petrol and CNG consumed in kg/hr.	[4]	5	3
Q.6	a) Elaborate effect of Hydrogen addition in SI engine (in terms of power) OR	[2]	6	2
	b) Explain behavior of IP,BP and FP with respect to speed.	[2]	6	2
	c) During Trial on 4 Cylinder 4 stroke SI Engine the recorded BP was 16 kW and fuel consumed was 0.00121 kg/sec. The same engine was fueled with petrol blended with 15 % ethanol (E15P85) and fuel consumption was found to be increased to $1.33 \times 10^{-3}$ kg/sec. Calculate the Brake thermal efficiency of engine powered blended petrol (for same power) Calorific Value of Petrol = 44000 kJ/kg Calorific Value of Ethanol = 28000 kJ/kg	[4]	6	3

**Note :** [ BT level 1: Remember 2:Understand 3: Apply 4: Analyse 5: Evaluate 6: Create ]