

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF CHEMICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST -II
FALL SEMESTER 2025-2026

SLOT: F2+TF2

Programme Name & Branch : B.Tech (Chemical Engineering)
Course Code : BCHE314L
Course Name : Fuels and Combustion
Faculty Name : D Chitra
Class Number : VL2025260101230
Date of Examination : 10-10-2025
Exam Duration : 90 minutes

Maximum Marks: 50

General instructions:

- Answer ALL Questions
- Assume necessary and appropriate data if required

Q. No	Question	Marks	Course Outcome (CO)	Bloom's Taxonomy (BL)
1.	Describe the important reactions involved during the reforming process. Additionally, discuss the impact of various parameters on the reforming process, highlighting how they affect product yield and quality.	10	3	BL2
2.	You are required to operate a gas engine for power generation. Three different gaseous fuels are available to you: producer gas, water gas, and natural gas. (a) Compare the above fuels with respect to their calorific value, combustion characteristics, cleanliness, and suitability for use in gas engines. (b) Based on your comparison, state which gaseous fuel you would prefer for power generation in the gas engine and justify your choice with suitable reasons.	10	3	BL2
3.	(i) Comment on "Hydrogen is considered the most promising fuel for aircraft". [3 marks] (ii) The coal feed to a producer contains 78% carbon, 4.5 % moisture, 8.5 % ash and a negligible amount of nitrogen and sulphur. The product gas analysis shows 8% CO₂, 16.3% H₂, 20.6% CO, 1% CH₄ and 54.1% N₂. Calculate the cold gas efficiency of the producer in percentage. Data: Calorific value of gas = 27195 kmol/kg, calorific value of coal = 7489.4 kcal/kg. [7 marks]	10	3	BL3

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✓4.	A producer gas used by a gas engine has the following percentage composition by volume: $\text{CO} = 15$; $\text{H}_2 = 25$; $\text{CH}_4 = 2$; $\text{CO}_2 = 12$; and $\text{N}_2 = 46$. If the air supplied to the engine is 40% in excess, what is the calorific value of one cubic metre of cylinder mixture? Calorific values of CO , H_2 , and CH_4 are 12,560, 10,890 and 35,600 kJ per cubic metre, respectively. What is the gas consumption per kW-hour if the engine thermal efficiency is 24 per cent?	10	4	BL3
✓5.	The percentage composition of a fuel oil on a mass basis is as follows: C, 85.1; H_2 , 13.7; and O_2 , 1.2. Calculate the minimum air required to burn completely 1 kg of this fuel oil and the percentage composition of the dry products of combustion on a mass and volume basis.	10	4	BL3