

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur– 603203.

DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK



VII SEMESTER

1909708 ALTERNATIVE FUELS & EMISSION CONTROL FOR AUTOMOBILE

Regulation–2019

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UNIT I - EMISSIONS FROM SI ENGINES AND THEIR CONTROL			
Introduction to SI Engine Combustion, Pollutants – sources – formation (CO, HC, NO _x and lead) – Effect of design and operating variables on emission formation, Effects of pollution on environment, human – Regulated & Unregulated emissions - Emission Standards - controlling of emission formation in engines, thermal reactors, catalytic converters, charcoal canister control for evaporative emission, positive crankcase ventilation system, nanoparticles - Introduction to noise pollution.			
PART - A (2 Marks)			
Q.No.	Questions	BT Level	Competence
1.	Why the engine emissions to be controlled?	BT-3	Applying
2.	Name four major parts that form as exhaust system in an automobile system.	BT-1	Remembering
3.	Mention the methods controlling smoke from diesel engine?	BT-2	Understanding
4.	What is known as smog in an automobile?	BT-1	Remembering
5.	What are the methods to clean the exhaust gas?	BT-2	Understanding
6.	What is the function of the catalytic converter?	BT-1	Remembering
7.	What is a catalytic converter?	BT-3	Applying
8.	What is catalyst?	BT-1	Remembering
9.	What are the basic requirements of a catalytic converter?	BT-2	Understanding
10.	What happens in a catalytic converter?	BT-1	Remembering
11.	How engine emissions are classified?	BT-3	Applying
12.	What is known as 'EURO NORMS'?	BT-2	Understanding

13.	What is known as 'BS NORMS'?	BT-2	Understanding
14.	What are the sources of air pollution by petrol engine?	BT-1	Remembering
15.	At what air-fuel ratio does the three way catalytic converter operate at maximum efficiency? How is this ratio achieved precisely?	BT-3	Applying
16.	Write the function of thermal reactor?	BT-1	Remembering
17.	Write short note about charcoal canister control for evaporative emission ?	BT-3	Applying
18.	Write the main pollutants emitted by petrol engine.	BT-1	Remembering
19.	Write short notes about particulate matter.	BT-3	Applying
20.	Write short notes about Aldehydes.	BT-3	Applying
21.	List out the sources of pollutants from SI engine.	BT-1	Remembering
22.	List out the two main sources of evaporative emissions.	BT-1	Remembering
23.	Write the effect of vehicular emission on environment?	BT-2	Understanding
24.	How the nanoparticles controlling of emission formation in SI engines.	BT-3	Applying
25.	What is noise pollution?	BT-1	Remembering

PART - B (13 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	Draw a neat sketch and explain about the source of pollutants from SI engine.	13	BT-5	Evaluating
2.	Draw a neat sketch and explain about the emissions as a function of equivalence ratio for a SI engine.	13	BT-5	Evaluating
3.	How HC emissions are formed? and Explain the sources of Hydro carbons.	13	BT-6	Creating

4.	(i)	How CO emissions are formed?	8	BT-4	Analyzing
	(ii)	How NOx emissions are formed?	5	BT-4	Analyzing
5.	Explain the major causes of NOx emissions.		13	BT-4	Analyzing
6.	Explain the effect of SI engine design and operating variables on emissions.		13	BT-5	Evaluating
7.	Explain about the effects of automobile emission pollution on environment & human.		13	BT-4	Analyzing
8.	Write in detail about the history of Indian emission regulations.		13	BT-4	Analyzing
9.	Write in detail about the emission regulations and fuel economy regulations for passenger cars and heavy-duty vehicles.		13	BT-5	Evaluating
10.	Write in detail about the Indian Bharat stage VI emission standards.		13	BT-4	Analyzing
11.	What are the modifications needed in the engine design and operating parameters.		13	BT-6	Creating
12.	Four stroke IC engine is economical and less pollutant than two stroke IC engine – Justify.		13	BT-6	Creating
13.	Explain the process of controlling emission formation in SI engines through catalytic converters with a neat sketch.		13	BT-6	Creating
14.	Explain the process of controlling emission formation in SI engines through thermal reactors with a neat sketch.		13	BT-4	Analyzing
15.	Explain the process of controlling emission formation in SI engines through charcoal canister control for evaporative emission with a neat sketch.		13	BT-5	Evaluating
16.	Explain the process of controlling emission formation in SI engines through positive		13	BT-6	Creating

	crankcase ventilation system with a neat sketch.			
17.	Explain the process of controlling emission formation in SI engines through nanoparticles.	13	BT-6	Creating
18.	Explain the noise pollution and write its effect on the human being.	13	BT-5	Evaluating

PART - C (15 Marks)

Q. No.	Questions	Marks	BT Level	Competence
1.	Write the critical factors & engine variables in HC emission mechanisms.	15	BT-5	Evaluating
2.	Explain about various methods for SI emission control.	15	BT-4	Analyzing
3.	With a neat sketch explain about the Exhaust Gas Recirculation (EGR)	15	BT-6	Creating
4.	Explain the effect of engine emission on human health.	15	BT-4	Analyzing
5.	Explain how three main exhaust pollutant products (CO, HC and NO _x) vary from different air-fuel ratios operating on either side of the stoichiometric ratio for a very rich mixture (11:1) to a very lean mixture (18:1).	15	BT-5	Evaluating

UNIT-II EMISSIONS FROM CI ENGINES AND THEIR CONTROL

Introduction to CI Engine Combustion, Emission formation in CI Engines (HC, CO, NO_x, aldehydes, smoke and particulates) - Physical and Chemical delay - Effects of design and operating variables on emission formation – Control techniques, Fumigation, EGR, HCCI, RCCI, NO_x, SCR, diesel oxidation catalytic converter, DPF, NO_x versus particulates trade off, Secondary air injection, thermal reactor, Cetane number effect, NO_x Adsorber, Laser Assisted Combustion.

PART - A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	Write short notes about the combustion process in compression ignition engines.	BT-2	Understanding
2.	List out the stages of combustion in CI engines.	BT-1	Remembering
3.	Write the factors affecting the delay period.	BT-3	Applying
4.	What are the major causes and problems of exhaust emissions to the surroundings.	BT-3	Applying
5.	What are the emissions that comes out of engine exhaust?	BT-2	Understanding
6.	What are the sources of non-exhaust emissions in an automobile.	BT-3	Applying
7.	How aldehyde and odour emissions are generated in a diesel engine?	BT-1	Remembering
8.	Draw the effect of rate of injection on smoke formation in diesel engines?	BT-2	Understanding
9.	What is the effect of fuel delivered per cycle on emissions from CI engines?	BT-3	Applying
10.	What is physical delay in CI engine?	BT-1	Remembering
11.	What is chemical delay in CI engine?	BT-1	Remembering
12.	What are the factors which affects the NO _x formation in CI engines?	BT-3	Applying
13.	What does the white smoke indicates?	BT-2	Understanding

14.	What are the sources of evaporative emissions?	BT-1	Remembering
15.	Write about the different mechanism of NO _x formation.	BT-2	Understanding
16.	What are the reasons for the formation of nitrogen oxides in an IC engine?	BT-3	Applying
17.	What are the draw backs of three way catalyst?	BT-2	Understanding
18.	What is meant by photo chemical smog?	BT-3	Applying
19.	What is the limitation of EGR?	BT-3	Applying
20.	What is HCCI?	BT-1	Remembering
21.	Write the purpose and function of NO _x adsorber?	BT-3	Applying
22.	What is DPF? and write the purpose of DPF?	BT-1	Remembering
23.	What is the expansion of RCCI? Where it is developed?	BT-3	Applying
24.	What is SCR? And write its purpose?	BT-2	Understanding
25.	What is the effect of laser assisted combustion?	BT-3	Applying

PART - B (13 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	Draw a neat sketch and explain about the source of pollutants from CI engine.	13	BT-6	Creating
2.	Draw a neat sketch and explain about the emissions as a function of equivalence ratio for a CI engine.	13	BT-5	Evaluating
3.	What is the difference between physical delay and chemical delay? State the factors on which delay period depends.	13	BT-4	Analyzing
4.	Explain the effects of CI engine design and operating variables on emissions.	13	BT-4	Analyzing

5.	What is meant by fumigation? What for it is? Where it is used? How it is carried out? Discuss its effects?	13	BT-4	Analyzing
6.	What is EGR? And explain how it reduces the NOx emissions.	13	BT-6	Creating
7.	Explain the process of controlling techniques in CI engines through HCCI with a neat sketch.	13	BT-5	Evaluating
8.	Explain the process of controlling techniques in CI engines through RCCI with a neat sketch.	13	BT-5	Evaluating
9.	What is a thermal reactor? How does it help to reduce emissions from engines.	13	BT-6	Creating
10.	What are catalytic converters? How do they help in reducing HC, CO and NOx emissions?		BT-4	Analyzing
11.	Explain the process of controlling techniques in CI engines through DPF with a neat sketch.	13	BT-6	Creating
12.	Write the effects of cetane number on ignition delay and exhaust emission.	13	BT-5	Evaluating
13.	Write the differences in PM emissions based on their nature and size.	13	BT-5	Evaluating
14.	Explain the precombustion factors influencing PM emissions while operating on alternative fuels.	13	BT-6	Creating
15.	Write the role of oxygenated additives and alternate fuels in NOx-PM trade-off.	13	BT-5	Evaluating
16.	Write the limitations and challenges in simultaneous in simultaneous control of NOx-PM emissions.	13	BT-4	Analyzing

17.	Explain the process of controlling emission formation in CI engines through NOx adsorber.	13	BT-6	Creating
18.	Explain the process of laser assisted combustion in CI engines.	13	BT-4	Analyzing

PART - C (15 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	Explain the CI engine design and the norms on diesel particulates and NOx emissions.	15	BT-4	Analyzing
2.	Write the regulatory development in diesel engine emissions and control for heavy duty vehicles and light duty vehicles.	15	BT-6	Creating
3.	What is secondary air injection? Explain how pumping fresh air into the exhaust system can help manufacturers tackle unwanted emissions.	15	BT-4	Analyzing
4.	Explain the role of precombustion and post combustion engine parameters and oxygenated fuels on NOx control.	15	BT-5	Evaluating
5.	Explain the trade-off relationship between NOx and Particulate Matter emissions in IC engines.	15	BT-5	Evaluating

UNIT III- EMISSION MEASUREMENT AND TEST PROCEDURES

Principle of operation of emission measuring instruments used in SI and CI engines, Non Dispersive Infra-Red, Flame Ionization Detector , Chemiluminescent analyzer, Liquid and Gas Chromatography, Spot sampling and continuous indication type smoke meters (Bosch,AVL and Hartridge smoke meters), Emission norms - EPA, CARB, Euro and Bharat norms, Emission Test Procedures - FTP, Steady State, Constant volume sampling (CVS 1 & 3),Chassis dyno - seven mode and thirteen mode cycles for emission sampling, Dilution tunnel, Sealed Housing for 193 Evaporative Determination (SHED) test, Sound level meters.

PART - A (2 Marks)

Q. No.	Questions	BT Level	Competence
1.	What is meant by evaporative emission control? Give an example for it?	BT-1	Remembering
2.	What are the fuel modifications can reduce the emission from SI engines?	BT-2	Understanding
3.	Write the catalytic oxidation and reduction reactions to convert the emissions in the exhaust?	BT-3	Applying
4.	Define EGR ratio?	BT-1	Remembering
5.	What are the draw backs of three way catalyst?	BT-2	Understanding
6.	What is meant by photochemical smog?	BT-2	Understanding
7.	What is the limitation of EGR?	BT-2	Understanding
8.	Why unleaded gasoline is used in vehicle fitted with catalytic converters?	BT-3	Applying
9.	In what way HC emission can be controlled in two stroke engine?	BT-3	Applying
10.	What are the main pollutants of diesel engine?	BT-2	Understanding
11.	What are the sources of pollutants from SI engine?	BT-1	Remembering
12.	What are the methods to control the SI engine emissions?	BT-2	Understanding

13.	How does combustion chamber design affect pollution from diesel engine?	BT-3	Applying
14.	Define the Bharath stage-II norms of emission standards?	BT-1	Remembering
15.	What is the principle of gas chromatograph used for emission measurement?	BT-3	Applying
16.	Draw the Japanese driving cycle used in emission testing?	BT-1	Remembering
17.	What is meant by FTP? When it is formed? What for it is?	BT-2	Understanding
18.	Which instrument is used for the measurement of nitric oxide emission?	BT-2	Understanding
19.	What is meant by a dilution tunnel? What for it is used?	BT-1	Remembering
20.	Sketch the Indian driving cycle?	BT-3	Applying
21.	What is the principle of Hatridge smoke meter?		
22.	What is the need of driving cycle?	BT-3	Applying
23.	What is Bharath stage VI?	BT-1	Remembering
24.	What is the principle behind light extinction method for measuring smoke?	BT-2	Understanding
25.	Give emission norms of both petrol and diesel engines based on Bharath stage IV.	BT-3	Applying

PART - B (13 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	What is meant by fumigation? What for it is? Where it is used? How it is carried out? Discuss its effects?	13	BT-5	Evaluating
2.	Explain how the crankcase emissions are controlled in the newly developed vehicles?	13	BT-5	Evaluating

	Also discuss about the above control system configurations?			
3.	Explain the principle, construction and efficiency of 3-way catalytic converter for an SI engine?	13	BT-4	Analyzing
4.	What is meant by secondary injection? How it is carried out? How it is controlling the emissions in a diesel engine? Discuss in detail.	13	BT-5	Evaluating
5.	Discuss the engine design modifications required for the control of unburned hydrocarbon emission?	13	BT-6	Creating
6.	Describe the three way catalytic converter with a neat sketch? What are its limitations?	13	BT-4	Analyzing
7.	Explain about the secondary air injection in detail with a neat sketch?	13	BT-6	Creating
8.	Describe the exhaust gas recirculation system to control the oxides of nitrogen in the exhaust gas?	13	BT-6	Creating
9.	Explain the various types of smoke from diesel engines.	13	BT-4	Analyzing
10.	Discuss the principle, construction and working of light extinction type smoke meter. Also indicate its scale and versatility?	13	BT-6	Creating
11.	Which instrument is dedicated used for nitric oxide measurement? Explain its working and limitations?	13	BT-5	Evaluating
12.	Explain the FTP tests. Also explain the Bharath stage IV and Euro norms of emissions standards?	13	BT-4	Analyzing
13.	Which instrument is used for the measurement of CO, CO ₂ ? Give its	13	BT-4	Analyzing

	principle of operation, construction and working?			
14.	Explain the working principle of flame ionization detector to measure the concentration of UHBC in the engine exhaust gas.	13	BT-4	Analyzing
15.	Explain the driving cycle for emission test procedure and also explain the constant volume sampling – 3 method.	13	BT-5	Evaluating
16.	Give a layout and explain the construction and working of flame ionization detector.	13	BT-6	Creating
17.	Explain the construction and working of non-dispersive infra-red analyser.	13	BT-6	Creating
18.	i) Write short notes about chassis dyno-seven mode and thirteen mode cycles for emission sampling.	10	BT-5	Evaluating
	ii) Write short notes about sound level meters?	3	BT-5	Evaluating

PART - C (15 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	With an aid of neat sketch explain about the working process of Liquid-Gas chromatography.	15	BT-6	Creating
2.	Give a layout of Chemiluminescent analyzer and explain the working process in detail.	15	BT-5	Evaluating
3.	Explain the Bharat stage emission standards and also explain the recently flowed BS-VI norms and how it is different from BS-IV.	15	BT-4	Analyzing

4.	Give a layout and explain the process of exhaust gas sampling and conditioning through dilution tunnel.	15	BT-4	Analyzing
5.	Explain the sealed housing evaporative determination (SHED) test.	15	BT-6	Creating



UNIT IV - ALCOHOL FUELS AND GASEOUS FUELS

Properties of alcohols, alcohol - gasoline blends, flexible fuel vehicle, methanol reformed gas engine, dual fuel system, spark assisted diesel engine, surface ignition engine, ignition accelerators, oxygenated additives, Engine modifications, Performance, Combustion and Emission characteristics in SI and CI engines. Properties of hydrogen, production and storage methods, safety precautions, biogas production and its properties, CO₂ and H₂S scrubbing in Biogas, Properties of LPG and CNG, use, Performance, Combustion and Emission characteristics of H₂, LPG, CNG and biogas in SI and CI engines.

PART - A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	What is meant by gasohol?	BT-1	Remembering
2.	What is meant by volatility of fuel? Draw the distillation curves for gasoline and alcohols.	BT-2	Understanding
3.	What are the disadvantages of using alcohols in IC engines?	BT-2	Understanding
4.	How does the latent heat of vaporization of ethanol affect the engine performance?	BT-2	Understanding
5.	What is the chief problem with alcohol – gasoline blends?	BT-3	Applying
6.	List out the raw materials for manufacture of alcohol fuels.	BT-1	Remembering
7.	Enumerate the desirable properties of alcohol as engine fuel.	BT-3	Applying
8.	What are the processes used to manufacturing of methanol?	BT-2	Understanding
9.	What are the processes used to manufacturing of ethanol?	BT-2	Understanding
10.	How the methanol manufactured from sugarcane?	BT-1	Remembering
11.	Compare Ethanol and Methanol.	BT-2	Understanding
12.	How anhydrous alcohol is prepared?	BT-2	Understanding

13.	How do you store gaseous fuels for IC engines?	BT-2	Understanding
14.	What are the safety measures to be considered while using gaseous fuels in IC engines?	BT-3	Applying
15.	What are the advantages of LNG fuel?	BT-3	Applying
16.	What are the properties of CNG fuel?	BT-3	Applying
17.	What are the advantages of CNG fuel?	BT-3	Applying
18.	What type of fuel delivery systems are used for hydrogen in SI engines?	BT-2	Understanding
19.	What are the emission benefits of using hydrogen?	BT-2	Understanding
20.	Why is hydrogen referred to as a “freedom fuel”?	BT-2	Understanding
21.	Enumerate some applications of natural gas.	BT-1	Remembering
22.	Explain the on-board production of hydrogen.	BT-1	Remembering
23.	What are the methods of hydrogen production?	BT-1	Remembering
24.	Explain about storage and handling of hydrogen as engine fuel.	BT-2	Understanding
25.	Compare the fuel properties of CNG and LPG as engine fuel.	BT-3	Applying

PART - B (13 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	Discuss in detail about different methods of ethanol production with schematic diagrams.	13	BT-6	Creating
2.	Discuss about the usage of alcohols in IC engines specific to their performance and emission parameters.	13	BT-4	Analyzing
3.	Discuss the performance and emission characteristics of methanol gasoline blend in SI engines.	13	BT-5	Evaluating

4.	List out the modifications required to use methanol in SI engine.	13	BT-6	Creating
5.	Explain the emission characteristics of an engine fuelled with DI-Methyl ether.	13	BT-4	Analyzing
6.	Explain the performance and emission characteristic of engine running on CNG.	13	BT-5	Evaluating
7.	Explain the performance and emission characteristic of engine running on LPG.	13	BT-4	Analyzing
8.	i) Describe the need for alternative fuels.	7	BT-6	Creating
	ii) Describe the production of ethanol.	6	BT-6	Creating
9.	Explain the performance of alcohol fuel compare with petrol fuel.	13	BT-5	Evaluating
10.	Explain with a neat sketch the working of hydrogen operated diesel engine.	13	BT-4	Analyzing
11.	Discuss the performance and emission characteristics of hydrogen in CI engines.	13	BT-5	Evaluating
12.	Discuss the performance and emission characteristics of hydrogen in GI engines.	13	BT-6	Creating
13.	i) Describe some important properties of CNG.	5	BT-5	Evaluating
	ii) What are the advantages and limitations of CNG?	8	BT-5	Evaluating
14.	Explain in detail about emission and combustion characteristics hydrogen fuel.	13	BT-4	Analyzing
15.	Explain the method of producing bio-gas from cow dung. And explain the performance and emission characteristics in CI engines.	13	BT-5	Evaluating
16.	Explain the products of hydrogen gas and its performance and safety aspect.	13	BT-6	Creating
17.	Define CNG and explain the working process of a CNG engine with a neat sketch.	13	BT-4	Analyzing

18.	Explain how an LPG engine works and what are all the safety precautions to be taken.	13	BT-6	Creating
PART - C (15 Marks)				
Q.No.	Questions	Marks	BT Level	Competence
1.	Explain the working principle of dual-fuel engine and List out the factors affecting combustion in dual-fuel engine and write the advantages of dual-fuel engines.	15	BT-6	Creating
2.	Write the comparison of petrol fuel and Liquefied Petroleum Gas (LPG) fuel and write the future scenario for LPG vehicles.	15	BT-5	Evaluating
3.	Justify – Hydrogen is another alternate fuel tried for IC engine.	15	BT-4	Analyzing
4.	Explain the following in detail about compressed natural gas storage and dispensing. <ul style="list-style-type: none"> • Storage • Piping • Dispensers • Control systems • Leak detection system • Fire suppression system 	15	BT-6	Creating
5.	Write the performance, combustion and emission characteristics of Biogas-diesel blends in CI engine.	15	BT-5	Evaluating

UNIT V - VEGETABLE OILS

Various vegetable oils for diesel engines, structure and properties, Problems in using vegetable oils in diesel engines, Methods to improve the engine performance using vegetable oils - Preheating, Transesterification, Emulsification, Blending with good secondary fuels, Production technologies for biofuels for internal combustion engines - pyrolysis, gasification, liquefaction - Semi-adiabatic engine, surface ignition engine, ignition accelerators, dual fuelling with gaseous and liquid fuels, Performance in engines – Performance, Emission and Combustion characteristics in diesel engines. Role of Nanofluids, additives and cetane improvers for performance improvement of vegetable oils as fuel.

PART - A (2 Marks)

Q.No.	Questions	BT Level	Competence
1.	Describe some important properties of straight vegetable oil (SVO)	BT-2	Understanding
2.	Name any four seeds from which oils can be obtained for the usage as fuel in IC engines.	BT-1	Remembering
3.	Explain unfavourable properties of vegetable oil.	BT-3	Applying
4.	What is esterification of vegetable oils?	BT-1	Remembering
5.	Write short note on degumming of SVO.	BT-3	Applying
6.	Mention various vegetable oils used for IC engines.	BT-1	Remembering
7.	What are the merits of using vegetable oils as fuels in CI engines?	BT-2	Understanding
8.	Name any four non-edible vegetable oils for use of IC engine fuel.	BT-1	Remembering
9.	List out the disadvantages of vegetable oil to run vehicle.	BT-1	Remembering
10.	List out the benefits of vegetable oil to run vehicle.	BT-1	Remembering
11.	What are the benefits of gasification?	BT-2	Understanding
12.	What are the benefits of liquefaction?	BT-2	Understanding
13.	List out the basic properties of vegetable oils.	BT-1	Remembering
14.	Write the reasons for direct use of vegetable oils in diesel engines.	BT-3	Applying

15.	What is semi-adiabatic engine?	BT-3	Applying
16.	What are ignition accelerators?	BT-1	Remembering
17.	What are the production technologies used for biofuel production?	BT-3	Applying
18.	What are the properties of vegetable oil used as fuel for IC engine?	BT-2	Understanding
19.	What are secondary fuels?	BT-3	Applying
20.	List out some gaseous fuel?	BT-1	Remembering
21.	What is dual fuel engine?	BT-2	Understanding
22.	What are ignition accelerators?	BT-3	Applying
23.	List out the role of nanofluids for performance improvement of vegetable oil as a fuel.	BT-1	Remembering
24.	Write short notes about nano additives.	BT-3	Applying
25.	What is meant by cetane improver?	BT-3	Applying

PART - B (13 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	i) Compare the Jetropa oil for the suitability in CI engines.	6	BT-5	Evaluating
	ii) Explain the performance and emission characteristics of Jetropa oil in the DI diesel engine.	7	BT-5	Evaluating
2.	Explain about the production of vegetable oils from various vegetables.	13	BT-4	Analyzing
3.	Discuss about the performance and emission characteristics of different blends of bio-diesel in detail with the help of neat sketch.	13	BT-5	Evaluating
4.	Describe the following. (i) Biodiesel feedstock selection (ii) Raw material for biodiesel production	13	BT-5	Evaluating

5.	With the help of neat sketch explain about the process involved in transesterification process in detail.	13	BT-5	Evaluating
6.	Explain the following process <ul style="list-style-type: none"> • Preheating • Transesterification • Emulsification • Blending 	13	BT-4	Analyzing
7.	Discuss about the performance and emission characteristics of different blends of biodiesel with the help neat sketch.	13	BT-5	Evaluating
8.	Explain the process of recovery of vegetable oils from plants.	13	BT-4	Analyzing
9.	Write the physical and chemical properties of vegetable oils.	13	BT-5	Evaluating
10.	List out and explain about the techniques available for reduction of viscosity of vegetables.	13	BT-4	Analyzing
11.	Discuss the characteristics of vegetable oil and biodiesel and compare with the diesel fuel.	13	BT-5	Evaluating
12.	List out the classification of pyrolysis and explain it briefly.	13	BT-5	Evaluating
13.	Write the process of coal gasification and liquefaction.	13	BT-4	Analyzing
14.	Explain the performance of semi adiabatic diesel engine with super charged air using vegetable oils.	13	BT-5	Evaluating
15.	What is dual-fuel engine and how does it work?	13	BT-5	Evaluating
16.	Justify – Dual fuel engines reduce the environmental impact of oil and gas operation.	13	BT-5	Evaluating
17.	Write the process of preparation of vegetable oil-based nanofluid.	13	BT-4	Analyzing
18.	Write the role of nano particles on biofuel production and as an additive ternary blend fuelled diesel engine.	13	BT-5	Evaluating

PART - C (15 Marks)

Q.No.	Questions	Marks	BT Level	Competence
1.	Explain in detail about the vegetable oil production, vehicle emission and performance characteristics.	15	BT-5	Evaluating
2.	Explain the following in detail about vegetable oil storage and dispensing. <ul style="list-style-type: none">• Storage• Piping• Dispensers• Control systems• Leak detection system• Fire suppression system	15	BT-6	Creating
3.	Explain in detail about new engine fuels from vegetable oils.	15	BT-5	Evaluating
4.	Explain in detail about the use of vegetable oils as diesel fuel.	15	BT-4	Analyzing
5.	Explain the role of additives and cetane improvers for performance improvement of vegetable oils as fuel.	15	BT-4	Analyzing
