GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Business

Bachelor of Business Administration
Semester End Examination - Aug 2024

Duration : 180 Minutes
Max Marks : 100

Sem VI /V- D1UG602T/BBAM3006 - Automotive Emission Control

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Discover the concept of alternative fuels and their role in mitigating emissions.	K3(6)
2)	A farming cooperative is using a fleet of Compression Ignition (CI) engines in their agricultural machinery. The cooperative is keen on understanding and minimizing lead emissions from these engines to enhance overall environmental sustainability. Illustrate how factors such as fuel quality, engine design, and combustion chamber characteristics influence the formation of lead emissions in CI engines. Discover practical recommendations for the farming cooperative on optimizing these factors to reduce lead emissions while maintaining the efficiency of their agricultural machinery.	K3(9)
3)	Examine the challenges and opportunities for automotive companies operating in multiple regions with different driving cycles such as the USA, Japan, Euro, and India. How can these companies optimize their vehicle designs and technologies to meet diverse regulatory requirements while ensuring market competitiveness?	K4(4)
4)	In a manufacturing plant that produces heavy industrial machinery, workers have raised concerns about high noise levels from the inlet systems of certain machines, leading to discomfort and potential health risks. As an environmental health and safety manager, design a noise measurement protocol specifically focusing on the inlet noise of these machines. Identify suitable measurement techniques and equipment, establish noise exposure limits based on regulatory guidelines, and propose engineering controls or administrative measures to mitigate the noise impact on workers' health and productivity. Additionally, classify a monitoring and continuous improvement plan to sustain a quieter working environment in the long term.	K4(8)
5)	As the operations manager of a heavy machinery production facility, you have been tasked with addressing engine combustion noise concerns in newly manufactured equipment. Discover a case study outlining the process of measuring engine combustion noise	K4(8)

in industrial machinery. Include details such as the selection of suitable noise measurement instruments, testing protocols for different machine types, interpretation of noise measurement data, and strategies for implementing noise reduction measures without compromising performance and efficiency.

6) In the context of automotive manufacturing and environmental sustainability, as a strategic manager, how would you justify and implement the integration of robust evaporative emission control systems in Spark Ignition (SI) engines within your organization? Provide a comprehensive plan that considers the environmental impact, regulatory compliance, and potential challenges associated with the adoption of such systems. Additionally, compile the expected benefits for the company, including its reputation, market competitiveness, and adherence to corporate sustainability goals. K5(10)

7) As a strategic manager tasked with enhancing environmental performance, carefully select and present a compelling argument for the benefits of modifying the fuel used in engines as a strategy for emission reduction. Consider alternative fuels and delve into their impact on combustion efficiency and pollutant formation. Develop a strategic plan that outlines the feasibility, advantages, and potential challenges associated with transitioning to alternative fuels. Address considerations such as infrastructure changes, supply chain implications, and potential resistance from stakeholders. Assess your selected approach by emphasizing the alignment with regulatory standards, corporate sustainability goals, and the potential positive effects on the organization's market positioning and reputation. K5(10)

8) Read the case and answer the following questions “Engine Emission Control Strategies: A Case Study on Design Innovations, Operating Parameters, and Fuel Modifications”. As the automotive industry faces increasing pressure to curb emissions and meet stringent environmental regulations, the focus on innovative design strategies for emission control becomes paramount. This case study explores the intricacies of engine emission control, delving into the impact of design and operating parameters on emission concentrations, the role of modifications in engine design, fuel composition changes, and the effectiveness of exhaust gas treatment devices. Case Background: Pioneer Motors, a leading automaker, is committed to advancing sustainable mobility solutions. In light of tightening emission standards and the growing global emphasis on environmental stewardship, Pioneer Motors recognizes the need to reevaluate its engine design and emission control strategies. This case study aims to investigate effective approaches to mitigate emissions, enhance compliance, and maintain a competitive edge in the automotive market. K5(15)

The key challenges of Pioneer Motors are:

(i) Effect of Design and Operating Parameters on Emission Concentrations: Analyze how various design and operating parameters, such as combustion efficiency, air-fuel ratio, and ignition timing, influence emission concentrations. How can Pioneer Motors optimize these parameters to reduce emissions without compromising engine performance?

(ii) Modification in Engine Design: Explore potential modifications in engine design, including changes to combustion chamber geometry, piston design, and valve timing. How can Pioneer Motors implement design innovations to enhance combustion efficiency and minimize pollutant formation?
(iii) Modifying the Fuel Used: Investigate the impact of fuel composition on emissions, considering alternative fuels and additives. How can Pioneer Motors adapt its engine design to accommodate cleaner-burning fuels, and what modifications are required to optimize performance?
(iv) Exhaust Gas Treatment Devices: Examine the effectiveness of exhaust gas treatment devices, such as catalytic converters and particulate filters, in reducing emissions. How can Pioneer Motors integrate these devices into its vehicles, and what are the challenges associated with their implementation?
Questions: In addressing the challenges of engine emissions and control strategies:
(a) How can Pioneer Motors develop a comprehensive understanding of the interplay between design and operating parameters to optimize engine performance and simultaneously reduce emissions? What research and development initiatives should be prioritized? (6 marks)
(b) Considering modifications in engine design, what strategies can Pioneer Motors employ to justify combustion efficiency and reduce emissions, ensuring that these modifications align with regulatory requirements and consumer expectations? (5 marks)
(c) In exploring fuel modifications, how can Pioneer Motors strategically transition towards cleaner-burning fuels, and what measures should be taken to modify existing engine designs to accommodate these fuel changes? (4 marks)

9) Read the case and answer the following question: “Case Study: Optimizing Spark Timing for Emission Control”. Company XYZ, a leading automotive manufacturer, is facing challenges related to emission control in their latest line of vehicles. The company is committed to environmental sustainability and wants to implement effective strategies to reduce emissions from their vehicles without compromising performance. K6(12)

The engineering team at XYZ is considering the implementation of a spark timing emission control system to address this challenge. The system involves adjusting the timing of spark ignition in the engine to optimize fuel combustion and minimize harmful emissions.
Your role as a management consultant is to analyze the feasibility and effectiveness of implementing a spark timing emission control system at Company XYZ.
Questions:
1. Discuss the technical feasibility of integrating a spark timing emission control system into XYZ's vehicle engines. (4 marks)
2. Assess the potential impact of the spark timing emission control system on reducing harmful emissions such as nitrogen oxides (NOx), carbon monoxide (CO), and hydrocarbons (HC). (4 marks)
3. Conduct a cost-benefit analysis of implementing the spark timing

emission control system. Estimate the initial investment, ongoing maintenance costs, and potential savings or benefits from reduced emissions and regulatory compliance. (4 marks)

10) Read the case and answer the following question: “Case Study: Noise Pollution from Automobiles and Noise Control”. In urban environments, noise pollution from automobiles has become a significant environmental concern. The constant increase in vehicular traffic, especially in metropolitan areas, has led to higher levels of noise pollution, impacting both human health and the environment. This case study explores the challenges of noise pollution from automobiles and strategies for effective noise control measures. K6(18)

Imagine a city with a population of over 5 million residents, experiencing rapid urbanization and industrial growth. As a result, the number of vehicles on the roads has skyrocketed, leading to elevated noise levels in residential, commercial, and industrial areas. Complaints from residents about noise pollution from vehicles, including cars, buses, trucks, and motorcycles, have been on the rise. The city's authorities are under pressure to address these concerns and implement effective noise control measures.

Questions:

(a) Evaluate the impact of noise pollution from automobiles on public health, quality of life, and the environment in urban areas. (6 marks)

(b) Analyze the challenges faced by regulatory authorities in enforcing noise control regulations and ensuring compliance from vehicle manufacturers and drivers. (6 marks)

(c) Discuss technological innovations, such as electric vehicles and noise-reducing materials, as part of the noise control strategy. (6 marks)