K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year: 2025-2026	Semester: III
Class: SY	Program: B.Tech
Branch Code: MEC	Pattern: 2023
Name of Course: Energy Systems for Mobility	Course Code: 2305206
Max. Marks:60	Duration:2 Hrs 30 Minutes

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Compare Two stroke engine with Four stroke engine. Discuss various trends of modern engines.	(6)	CO1
Question No. 2			
2a)	List different pollutants emitted from vehicle. Explain the phenomenon of formation of the pollutants.	(6)	CO2
Question No. 3			
3a)	Discuss with neat sketch working of advantages of common rail injection system over conventional individual pump and injector system.	(8)	CO2
	OR		
3b)	Explain Dry sump Lubrication system used in vehicles. What are the advantages of using Dry sump Lubrication over Wet sump Lubrication?	(8)	CO2
3c)	Trial on single cylinder, four stroke engine gave following observations; Bore = 20 cm, Stroke length = 40 cm, Indicated Mean effective pressure = 6 bar, Torque = 407 Nm, Speed = 250 rpm, fuel consumed = 4 kg/hr, Calorific value of fuel = 43000 kJ/kg, Mass flow rate of coolant = 4.5 kg/min, Air to Fuel ratio = 30:1, Rise in temperature of coolant = 45 ^{0}C, Temperature of exhaust gases = 420 ^{0}C, Atmospheric temperature = 20 ^{0}C, Specific heat of exhaust gases =1 kJ/kgK, Specific heat of water = 4.18 kJ/kgK. Calculate IP, BP and draw heat balance sheet on kJ/sec basis.	(8)	CO2
	OR		
3d)	A four cylinder engine develops 15.24 kW of brake power. The fuel consumption is 0.0014 kg/sec. A Morse test was conducted and the brake power values obtained when each cylinder was cut off one by one are 10.45, 10.38, 10.23, and 10.45 kW respectively. The test was conducted at a constant speed. Calculate Indicated power, Friction power, Mechanical efficiency and thermal efficiency of engine. Consider calorific value of fuel as 44000 kJ/kg.	(8)	CO2
Question No. 4			

4a)	Explain with neat sketch various components used in electric vehicles.	(8)	CO3

OR

4b)	Write your comments on the statement "Electric vehicles doesn't reduce pollution to zero".	(8)	CO3
4c)	The output voltage and current drawn by motor is 70 Volt and 11 Amp. Consider 5% extra current drawn during acceleration. Assuming Battery discharging efficiency = 85 %, Calculate battery pack capacity for a two-wheeler with range of 160 km and Gross weight of 250 kg running at a speed of 50 Km/hr.	(8)	CO3

OR

4d)	A 3000 kg electric two-wheeler vehicle for a speed of 80 Km/hr on a flat road with rolling resistance coefficient of 0.004 and coefficient of drag of 0.88. Assume density of air =1.2 kg/m^3 and frontal area = 3 m^2. Take Motor efficiency =80 % and Battery discharging efficiency= 85 %. Calculate battery pack capacity required to propel the vehicle.	(8)	CO3

Question No. 5

5a)	Elaborate with net sketch and electrochemical reactions, the Polymer Electrolyte Membrane Fuel Cell (PEMFC).	(8)	CO4

OR

5b)	Explain Alkaline Fuel Cell (AFC) with net sketch and write electrochemical reactions involved.	(8)	CO4
5c)	Describe Fuel cell Hybrid vehicle drive train. What are the merits of Fuel cell driven vehicles over Electric vehicles?	(8)	CO4

OR

5d)	Describe various methods of hydrogen storage and explain any four in detail.	(8)	CO4

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