MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

DEPARTMENT OF MECHATRONICS

VI SEMESTER B.TECH. (MECHATRONICS)
END SEMESTER MAKEUP EXAMINATION

Subject: Automobile Engineering   Subject Code: MTE 3251

Time: 3 Hrs   Date: / /2024   MAX. MARKS: 50

❖ Answer **ALL** the questions.
❖ Make suitable assumptions if required, and clearly state them in your answer.
❖ Marks will be awarded for clarity, depth of understanding, and relevance of examples.

Q. No.	Questions	M	CO	PO	LO	BL
1A	Explain in detail how the electrical system supports the operation of critical safety features such as airbags, ABS (anti-lock braking system), and traction control.	4	5	1, 2	2	2
1B	Describe in detail how the electrical system of an electric vehicle differs from that of a traditional internal combustion engine vehicle, and identify unique challenges.	3	5	1, 2	2	2
1C	Discuss the HVAC system for automobiles.	3	5	1, 2	2	2
2A	Examine the design and functionality of a variable-ratio steering system, elucidating its ability to dynamically adjust steering ratio according to both vehicle speed and driver input, and highlighting the advantages it offers in terms of handling and maneuverability.	4	4	1, 2	2	2
2B	Describe MacPherson Strut with a neat sketch.	3	4	1, 2	2	2
2C	Distinguish the benefits and drawbacks of air suspension systems against traditional coil or leaf spring suspension systems.	3	4	1, 2	2	2
3A	A centrifugal clutch consists of four shoes, each having a mass of 1.5 kg. In the engaged position, the radius to the centre of gravity of each shoe is 110 mm, while the inner radius of the drum is 140 mm. The coefficient of friction is 0.3. The pre-load in the spring is adjusted in such a way that the spring force at the beginning of engagement is 700N. The running speed is 1440 rpm. Calculate (i) the speed at which the engagement begins, and (ii) the power transmitted by the clutch at 1440 rpm.	4	3	1, 2	2	2
3B	Illustrate the working of a sliding mesh gearbox.	3	3	1, 2	2	2
3C	Explain how the radial tire design enhances grip, stability, and durability compared to bias-ply tires.	3	3	1, 2	2	2

4A	Differentiate anti-lock braking systems (ABS) and electronic stability control (ESC) systems with 6 characteristics. Design a schematic diagram illustrating the hydraulic brake system of a car, highlighting four essential components and their interconnections..	5	5	1, 2	2	2
4B	Illustrate electro-hydraulic brakes for energy regeneration.	3	5	1, 2	2	2
4C	Determine the average braking force required to bring a 1000 kg car traveling at 10 m/s to a stop over a distance of 10 meters.	2	5	1, 2	2	2
5A	Discuss in detail: Bharat Stage Emission Standards.	4	2	8	8	2
5B	Explain the terms (i) Pinging, (ii) Scavenging, (iii) Octane number, (iv) Clearance Volume.	4	1	1, 2	2	2
5C	Describe an Acreman steering system and enumerate its parts.	2	4	1, 2	2	2