		Reg. No.									
	MANIPAL I	NSTITUT	Е (	OF	TE	CF	IN	OL	00	ΤY	
NSAIRED BY LIN	MANIPAL (A constituent unit of MAF	IE, Manipal)									

# DEPARTMENT OF MECHATRONICS VI SEMESTER B.TECH. MECHATRONICS

## END SEMESTER EXAMINATIONS, MAY 2023

## SUBJECT: AUTOMOBILE ENGINEERING [MTE 3251]

## **Time: 3 Hours**

## MAX. MARKS: 50

#### **Instructions to Candidates:**

#### ✤ Answer ALL the questions.

Q. No		Μ	СО	PO	LO	BL
1A.	Explain the construction of full frame, compare its construction with unibody design and identify the types of loads acting on the full frame.	5	1	1,2	1,2	L2
1 <b>B</b> .	Discuss the architecture of common rail diesel injection (CRDi) system used in automobile engines			1,2	1,2	L2
1C.	Identify the roles of various sensors in CRDi engine	2	1	1,2	1,2	L2
2A	Describe the working of a synchro mesh gearbox and compare its merits/demerits with sliding mesh gearbox on the key characteristics			1	1	L2
28	An epicyclic gear train is shown schematically in the Figure 2B. The sun gear 2 on the input shaft is a 20 teeth external gear. The planet gear 3 is a 40 teeth external gear. The ring gear 5 is a 100 teeth internal gear. The ring gear 5 is fixed and the gear 2 is rotating at 60 rpm counter clockwise. Determine the direction and the rotational speed of the arm 4 which is attached to the output drive shaft.	3	3	1	1	L2
2C	Differentiate BS4 and BS6 emission norms of the automobile industry with at least 4 key features	2	2	8	8	L2
3A	Describe the working of a multi-plate friction clutch and identify the factors to be considered while designing friction clutch	5	3	1	1	L2
3B	In a radial tyre, a 100 g of rubber tread is detached from a portion of the tyre tread at a distance of 250 mm from its center. When the wheel has reached a speed of 160 Km/h, determine the angular speed of wheel (RPM) and the corresponding centrifugal force.	3	3	1	1	L2
3C	Explain the effect of dynamic and static imbalance on the oscillation amplitude of the unbalanced wheel	2	4	1	1	L3

<b>4</b> A	Describe the working of air suspension system and detail the bonce	4	4	1	1	L2
	frequency characteristics of various types of suspension system.					
<b>4B</b>	Classify the automobile steering system and describe the working of	4	4	1	1	L2
	electric power steering system.					
<b>4</b> C	A car of mass 800 kg is travelling at speed of 36 Kmph. Determine its	2	4	1	1	L2
	kinetic energy and the average braking force to stop the vehicle to rest					
	in 20 meters.					
5A	Describe the growing challenges and requirements of automotive	4	5	1,2	1,2	L2
	interior materials.					
<b>5B</b>	Discuss the architecture of automated climate control system	4	5	1,2	1,2	L2
			-	1.0	1.0	
5C	List 8 important properties of brake materials	2	5	1,2	1,2	L2