		Reg. No.								
ANIPAL INSTITUTE OF TECHNOLOGY										
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DEPARTMENT OF MECHATRONICS VII SEMESTER B.TECH. (MECHATRONICS ENGINEERING) END SEMESTER EXAMINATIONS, JAN-FEB 2021

SUBJECT: HYBRID AND ELECTRIC VEHICLES [MTE 4004]

03-02-2021

Time: 3 Hours

MAX. MARKS: 50

		10111					
	Instructions to Candidates:						
	✤ Answer ALL the questions.						
 Data not provided can to be suitably assumed. 							
Q. No		M	CO	PO	LO	B	
A.	A vehicle having large grade has the following specifications:	05	2	1,2	C1	3	
	Rolling resistance coefficient=0.01,						
	Drag coefficient=0.5,						
	Curb Weight= 4800 N,						
	Vehicle frontal area of 1.98 m ² ,						
	Density=1.275 kg/m3.						
	Engine runs at 3500 RPM,						
	Produces 186 N-m of torque.						
	Gear reduction ratio is 3,						
	Driveline efficiency is 88%						
	Road wheel radius is 9 inches						
	Length of vehicle is 14.7ft.						
	Height of centre of gravity is 1.64ft.						
	Adhesive coefficient is 0.6.						
	Estimate the tractive effort required by front and rear wheel when						
	a) Centre of gravity is at mid length of vehicle from both wheels.						
	b) Centre of gravity is at front wheel.						
	c) Centre of gravity is at rear wheel.						
	Comment on observations made from obtained results.						
B.	List the various types of vehicles based on fuels and discuss their	03	1	1	C1	2	
	economics.						
C.	Mahindra KUV 100 vehicle has the engine characteristics as depicted	02	2	1,2	C1	3	
	in Fig. 2A and has the gearbox specifications given in Table 2A.						



3B.	Describe the energy savings and shortcomings of HEV when compared conventional vehicle.			1	C1	2
3C.	A hybrid electric vehicle with dual transmission has the following characteristics as shown in Fig. 3C. Identify the configuration and describe it.	03	3	1	C1	2
3D.	Identify the HEV configuration for the vehicle shown in Fig. 3D with reasoning.	02	3	1	C1	3
4A.	Discuss in detail the control strategies for Switched Reluctance Motor in Electric Vehicle Application with four quadrant operation		3	1	C1	2
4B.	Summarize the energy efficiencies of conventional and EV in urban and highway driving			1	C1	2
4C.	Identify suitable power converters required in Electric Vehicle			2	C1	3
5A.	 application. A HEV AWD vehicle having hybridness of 57.14% is running with a ICE of 75kW at 3500rpm, estimate the wheel motor power that is running at 750rpm. If the behavior power is wild exclude to the IC 			1	C1	3
5B.	Describe the complete closed loop control of EV and illustrate why we need drive cycles		4	1	C1	2
5C.	Describe the merits and demerits of fuel cell vehicles with solar based vehicles.	04	4	1	C1	2