



End Semester Examination – Nov/Dec – 2016

Code : **14EE3032**
Sub. Name : **Hybrid – Electric Vehicle Powertrains**

Semester : **2016-17 ODD**
Duration : **3hrs**
Max. marks : **100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks																	
1.	a.	Explain with relevant diagram the operating characteristics and control of Brushed DC motor as a source of propulsion in an EV	C01	20																	
(OR)																					
2.	a.	With a neat flow diagram explain how the generated propulsion force is transferred to the wheels of a vehicle.	CO1	10																	
	b.	Compare and comment on the torque and speed characteristics of DC motor, Three Phase Induction motor, PMSM and SRM	C02	10																	
3.	a.	Comment on the various available control techniques applicable for electric vehicle propelled with an AC Induction motor drive.	CO3	20																	
(OR)																					
4.	a.	Discuss about the various factors that influence Motor Efficiency	CO2	10																	
	b.	Explain the function of clutch in transmission system	C01	10																	
5.	a.	Elaborate the technical methodology for achieving variable speed and tractive effort of an Induction Motor	CO2	20																	
(OR)																					
6.	a.	Explain the controlling strategy adopted to control the Switch Reluctance Motor under constant torque and constant power region in order achieve good starting acceleration and high speed during the course of run	CO3	20																	
7.	a.	Interpret the change in the traction motor rating (power and torque) for the cases mentioned in table below. <table border="1"><tr><td></td><td>Mass of the Vehicle</td><td>Aerodynamic drag</td><td>Rolling Coefficient</td></tr><tr><td>Case 1</td><td rowspan="4">1500 kg</td><td>0.23</td><td>0.013</td></tr><tr><td>Case 2</td><td>0.23</td><td>0.02</td></tr><tr><td>Case 3</td><td>0.5</td><td>0.013</td></tr><tr><td>Case 4</td><td>0.5</td><td>0.02</td></tr></table> Other Specification: $A_f=1.85m^2$, η_t 90 %. Single gear ratio can be considered. $X= 4$. Air density 1.1204 kg/m^3 . <i>Performance speciation</i> : Acceleration time (from 0 to 150 km/h) 10 ± 1 sec, Maximum gradeability > 30% at low speed and >5 at 100 km/h, Maximum speed 160 km/h. N_{max} Motor = 4000rpm		Mass of the Vehicle	Aerodynamic drag	Rolling Coefficient	Case 1	1500 kg	0.23	0.013	Case 2	0.23	0.02	Case 3	0.5	0.013	Case 4	0.5	0.02	CO2 CO3	20
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8.	a.	Interpret the shortcomings of EV usage in urban traffic scenario and scheme an electrical method of extending the range(distance covered) of EV	CO3	10																	
	b.	Discuss about the advancement in the HEV power train	C01	10																	
Compulsory:																					

9.	a.	Discuss about the operation, characteristics and different types of fuel cell vehicle. Also comment on the advantage of EV using battery and fuel cell	CO1	20
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ALL THE BEST