Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

# II SEMESTER M.TECH. (OPEN ELECTIVE)

## **END SEMESTER EXAMINATIONS, APRIL/MAY 2017**

## SUBJECT: HYBRID & ELECTRIC VEHICLES [AAE 5282] REVISED CREDIT SYSTEM (03/05/2017)

#### Time: 3 Hours

#### MAX. MARKS: 50

### Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.

1A.	Define rolling resistance and explain different conditions for the pressure distribution on the tyres about the road surface.	5
1B.	Differentiate shape drag with friction drag.	2
1C.	Obtain the dynamic equation for the tractive effort for the front and rear wheels of the vehicle.	3
2A.	Discuss the characteristic curves for the internal combustion engine.	5
2B.	Compare traction force vs. speed map of an internal combustion engine with and without gearbox	3
2C.	List the energy saving potentials of the HEV's and discuss any one.	2
3A.	Compare speed coupling to torque coupling.	2
3B.	Sketch and explain the functionality of complex hybrid drive train.	3
3C.	Sketch and discuss the concept of in wheel drive.	5
4A.	Sketch the wiring diagram and compare the working of analog shunt equalization with Zener-switch types of passive cell balancing converters.	5
4B.	Write a note on isolated DC/DC converters.	3
4C.	Discuss the working of ideal switch and its conduction characteristics in four quadrants.	2
5A.	Sketch and explain the principle of operation of Permanent magnet electric	4
5B.	In a reverted epicyclic gear train, the arm A carries two gears B & C and a compound gear D, E. The meshing of gear B is with E and meshing of D is with C. Find the speed and direction of gear C when the gear B is fixed and arm A makes 100 rpm clockwise. No. of teeth on gears B, C & D are 75, 30 & 90 respectively.	4

**5C.** Compare star with delta starter.