Reg. No.										

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

VII SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV-DEC2018

SUBJECT: HYBRID AND ELECTRIC VEHICLES [MTE 4004]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Data not provided may be suitably assumed

1A. State the impact on airflow, maximum torque and maximum power when there is a change in a spark ignition engine from 2 valves per cylinder to 4 valves (2 inlet and 2 exhaust) per cylinder. **04**

1B. Discuss with neat sketches the design of traction motor for transmission levels at multi-gear depending upon speed-torque characteristics. **06**

2A. State the differences between field and armature orientations in different types of DC motors and compare the torque variations. **05**

2B. Formulate and sketch the potential difference across the electrodes of a fuel cell using current – voltage curves. **05**

3A. Construct a parallel HEV which is sized with primary steady power source and dynamic secondary power source. **04**

3B. Recall the various components of a 2 stroke ICE and the importance of combustion chamber in terms of volume. **04**

3C. Draw an auxiliary subsystem in an electric propulsion system. **02**

4A. Discuss the working of AFC and MCFC with its limitations. **05**

4B. List out the fundamentals of regenerative braking and outline the power flow in a HEV while establishing regenerative braking. **05**

5A. Calculate the output resultant torque and speed for a gear box having three gears, where Z_1=11, Z_2=9, Z_3=17. Plot speed-torque graph over specified time intervals by considering T_{in1} from 15 to 35 for 5 intervals and, where ω_{in1} = 1500rpm T_{in2} = 90Nm & ω_{in2} = 550rpm. **05**

5B. Design a series HEV using an induction motor and construct a circuit for pole switching using power electronics for speed & torque control. **03**

5C Identify an application for speed coupling HE drive trains using transmotor and construct the source switching operation between primary & secondary power source. **02**