


FACULTY: ENGINEERING

FIRST SEMESTER EXAMINATIONS

2016/ 2017 ACADEMIC SESSION


HOD'S SIGNATURE

COURSE CODE: ATE 407

COURSE TITLE: MODELING, ANALYSIS AND CONTROL OF HYBRID ELECTRIC VEHICLES
– 3 UNITS

DURATION: 2 HOURS 30 MINUTES

INSTRUCTIONS

1. ANSWER 4 QUESTIONS OF YOUR CHOICE
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM
3. YOU ARE NOT ALLOWED TO BORROW CALCULATORS AND ANY OTHER WRITING MATERIALS

Question 1

- (a) Explain the Mode of operation of this simple parallel hybrid Architecture as shown in the figure below.

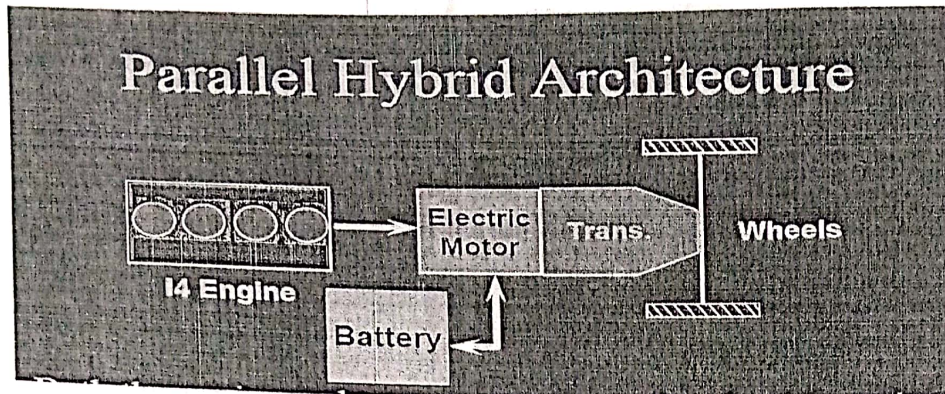


Fig. 1.0

6 marks

- (b) What is the major reason why the battery of an hybrid electric vehicle is placed under the rear seat of a vehicle? 4 marks
- (c) Electric cars are completely silent because there is no internal combustion engine. In fact they are so quiet that manufacturers are thinking that EVs may one day require some kind of noise device on them to alert pedestrians that they are within the area. Relate this information to internal combustion engine and explain. 5 marks

Question 2.

- (a) What are the benefits of Electric Vehicle and Hybrid Electric Vehicle compared with conventional vehicles 5marks
- (b) What is the difference between Electric Vehicle and Hybrid Electric Vehicle? 4 marks
- (c) Define and discuss the relationship between the following:
- i. inverter 3 marks
 - ii. motor 3 marks

Question 3

- (a) Write short notes on the following:
- i. Engine Downsize

- ii. Regenerative Braking
- iii. Electric Launch & Drive

9 marks

(b) Why does society need/want hybrid and electric vehicles?

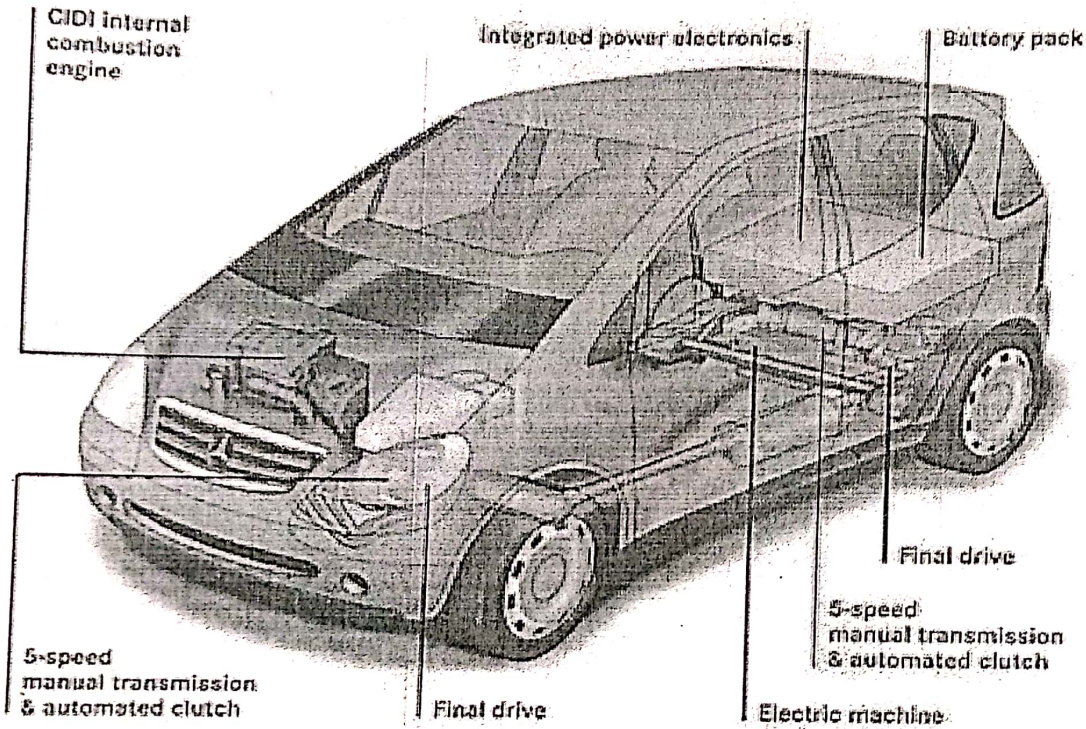
3 marks

(c) The HEV's battery runs the vehicle in pure electric mode and provides engine boost. Discuss.

3 marks

Question 4.

(a) Explain how the Hybrid Electric Vehicle operates using the figure below as a case study.



5 marks

(b) Discuss the two basic types of hybrid electric vehicles: (a) series, and (b) parallel

4 marks

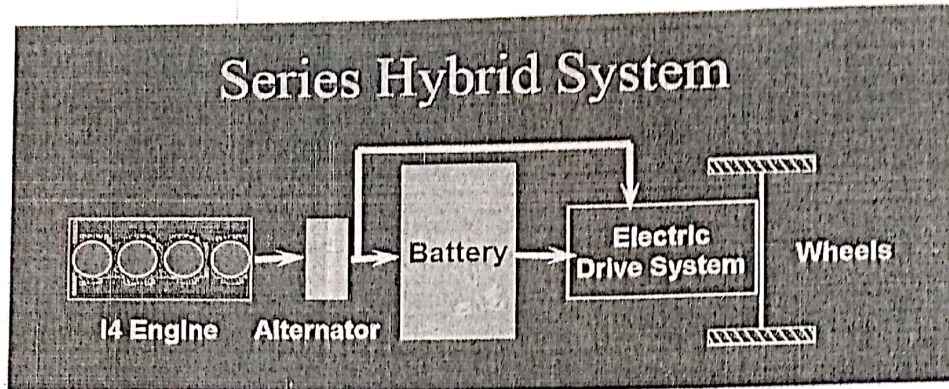
(c) Define what is meant by:

- (i) an analog circuit.
- (ii) Digital circuit
- (iii) Electric Circuit

6 marks

Question 5

(a) Explain the Mode of operation of this simple Series hybrid System as shown in the figure below.



6 marks

(b) What is the benefit of the Nickel Metal Hydride Battery over other types of batteries?

3 marks

(c) State the Disadvantages of the Nickel Metal Hydride Battery over other types of batteries

3 marks