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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**MAKE-UP EXAMINATION JULY 2024**

**Course Code**: EEE 3027

**Course Name**: Electric Vehicle Technology

**Program** : B.Tech

**Date**: 22-07-2024

**Time**: 09:30AM to 12:30PM

**Max Marks**: 100

**Weightage**: 50%

**Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. Scientific and Non-programmable calculators are permitted

**Part A [Memory Recall Questions]**

**Answer all the Questions. Each question carries TWO marks. (10Qx 2M= 20M)**

1. A vehicle traveling at a particular speed in air encounters a force resisting its motion. This force is known as [CO1, Knowledge]

a.Tractive force b. Aerodynamic drag c. Rolling force d. Skin drag

1. Higher C (capacity) rates adversely impact the battery life. Higher the charging rating lower will be the life of the battery. For a 10 kWh battery if we charge or discharge at 1C it takes 1 hour time. If we charge at 4C rate then…………….. (C.O.No.4) [Knowledge]

a. 40 kW charge in 60 min b. 40 kW charge in 30 min

c. 40 kW charge in 15 min d. 40 kW charge in 45 min

1. There are various types of pollutants and greenhouse gases which are released as emission from vehicles and they are the reasons for smoke, and air pollution.

(C.O.No.1) [Knowledge]

a. Carbon Monoxide and carbon dioxide b. NOx gases

c. Hydrocarbons d. All of the above

iv. The energy flow in EV is mainly via flexible electrical wires rather than bolted flanges or rigid shafts. Electric vehicles are generally powered by ( ) (C.O.No.4) [Knowledge]

a. Aluminum batteries b. Lead acid batteries

c. sodium batteries d. None of the above

v. A hybrid vehicle combines any two power (energy) sources. The combination of two power sources may support two separate propulsion systems. What purpose does a generator serve in a hybrid vehicle? (C.O.No.2) [Knowledge]

* 1. It converts nuclear energy into more nuclear energy
  2. It converts mechanical energy into electrical energy
  3. It converts chemical energy into electrical energy
  4. It converts electrical energy into mechanical energy

vi. Gasoline cars of 1900 were noisy, dirty, smelly, cantankerous, and unreliable. In comparison, electric cars were comfortable, quiet, clean, and fashionable. Golden age of Electrical vehicle marked from ------- to -------- with peak production of electric vehicles in 1912.

(C.O.No.1)[Knowledge]

a. 1881-1924 b. 1890-1924 c. 1900-1924 d. 1912-1960

vii. Most commonly, the propulsion force in HEV is provided by a combination of electric motor and an ICE. Which of the following has simple drive train system?(C.O.No.2) [Knowledge]

a. Series Hybrid c. Series-Parallel Hybrid

b. Parallel Hybrid d. All of these

vii. Electric propulsion systems are at the heart of EVs and HEVs. The choice of electric propulsion systems for EVs and HEVs mainly depends on several factors including

(C.O.No.3)[Knowledge]

a. driver’s expectation b. vehicle constraints c. energy source d. All of these

ix. An electric battery is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices. Capacity of a battery is expressed in (C.O.No.4) [Knowledge]

a. Ah b. Wh c. Vh d. WA

x. For selecting the appropriate electric vehicle motors, one has to first list down the requirements of the performance that the vehicle has to meet, the operating conditions and the cost associated with it .Go-kart vehicle and two-wheeler applications which requires less performance (mostly less than 3 kW) at a low cost, it is good to go with

(C.O.No.3)[Knowledge]

a. BLDC motor b. PMSM motor c. Induction motor d. SRM motor

**Part B [Thought Provoking Questions]**

**Answer all the Questions. Each question carries TWELVE marks. (4Qx12M=48M)**

2. Mr. Naveen is working on go-kart project at Presidency University. He worked out on chassis part, and designing part. Now he wanted to select a battery with nominal voltage of 48V, Ah rating is 24Ah for his vehicle and he is not having any idea about batteries which he wanted to purchase. Mr. Naveen approached you regarding the selection of battery. Explain the way you are going to guide him, so that he will be able to choose a battery from variety of batteries. (C.O.No.4) [Comprehension]

3. The core element of the EV, apart from Electric Vehicle Batteries, which replaces the Internal Combustion engines is an Electric motor. EVs use traction motors that are capable of delivering torque to the wheels. Classify the motors and select the motors which are used in two, three and four wheeler Electric vehicles based on the features of motors.

(C.O.No.3) [Comprehension]

4. Ola Electric is recalling 1,441 units of its electric two-wheelers in the wake of incidents of vehicles catching fire, according to a company statement. The company said its investigation into the fire incident on March 26, in Pune, is ongoing. If you are the investigator engineer, list the possible causes for explosion and report the possible measures for avoiding the issues. (C.O.No.4) [Comprehension]

5. A typical series hybrid electric drivetrain has several operating modes that can be used selectively according to the driving conditions and wishes of the driver. Obviously, the performance of the drivetrain relies mainly on control quality, in which control strategy plays a crucial role. There are several control strategies that can be employed in a drivetrain for vehicles with different mission requirements. Explain any two control strategies which are used to meet the power demand of the driver and, at the same time, maintain the SOC of the PPS at a high level. (C.O.No.2) [Comprehension]

**Part C [Problem Solving Questions]**

**Answer all the Questions. Each question carries SIXTEEN marks. (2Qx16M=32M)**

6. Mr. Arun wants to select the power rating of a motor for a two wheeler electric vehicle design with the following specifications. He wants the electric vehicle to run at speed of 65 kilometer per hour with the drag coefficient of 0.3, frontal area of 5 meter square, air density of 1.25 kg per meter cube, rolling coefficient is 0.02, weight of the vehicle during running condition is 180kg, gradient angle is 3 degrees and the wheel radius is 0.29m. State the parameters that are to be considered by Mr. Arun. Compute the minimum power and torque rating of motor which are to be selected by Mr. Arun to have propulsion according to the above specifications? (C.O.No. 1) [Application]

7. Mr. Ramu is working on go-kart project for participating in a competition. He worked out on chassis part, and designing part. Now he wanted to select a Lithium ion battery to drive a motor with power rating of 4.7kW. The battery specifications are: nominal voltage is 72V, Ah capacity is 48Ah, and cell capacity of 1.5Ah, battery efficiency is 98%.

i. List the parameters that are to be computed by Mr. Ramu, in order to understand the requirement of cells and usage of battery.

ii. Compute the listed parameters and defend the importance of each parameter.

(C.O.No. 4) [Application]