

QUESTION BANK

AUTOMOBILE ELECTRICITY

SEMESTER:- 5TH

BRANCH:- AUTOMOBILE ENGG.

THEORY:- 3

CHAPTERS:

- 1. STORAGE BATTERY**
- 2. GENERATING SYSTEM**
- 3. ALTERNATOR**
- 4. IGNITION SYSTEM**
- 5. LIGHT**
- 6. ACCESSORIES & CONTROL**
- 7. WIRING SYSTEM**

**STATE COUNCIL FOR TECHNICAL EDUCATION &
VOCATIONAL TRAINING, ODISHA, BHUBANESWAR**

CHAPTER-1 : STORAGE BATTERY

Q. 1 The photovoltaic cell operates on the principle of_____.

- A. photovoltaic effect
- B. Ferranti effect
- C. Skin effect
- D. None of the above

Ans.: A

Q. 2 The_____defined as the ration of ampere hours taken from the battery to the ampere hours supplied to it while charging.

- A. Kilowatt hour
- B. ampere-hour efficiency
- C. energy
- D. Both B and C

Ans.: B

Q. 3 The capacity of battery is measured in_____.

- A. A-H
- B. Volts
- C. Watt-hour
- D. All of the above

Ans.: A

Q. 4 Battery is a device which converts chemical energy into_____.

- A. mechanical energy
- B. potential energy
- C. electrical energy
- D. Wind energy

Ans.: C

Q. 5 “The mass of an ion liberated at an electrode is directly proportional to the quantity of electricity which passes through the electrolyte.” This statement is given by:

- A. Gauss’s law
- B. Faraday’s 1st laws of electrolysis

C. Faraday's laws of electromagnetic induction

D. Fleming's rule

Ans.: B

Q.6 _____ is defined as the mass of its ions liberated at the electrode in one second when a constant current of one ampere passes through the electrolytic having that substance as one of the ions.

A. Electro-chemical-equivalent

B. Weight of the substance

C. mass of the substance

D. All of the above

Ans.: A

Q. 7 correct relation of faraday's 1st law of electrolysis is ____

A. $\Delta m = Z \Delta q$

B. $\Delta m = ZI \Delta t$

C. $\Delta m = Z / \Delta q$

D. Both A and B

Ans.: D

Q. 8 E.C.E of silver is equal to _____.

A. $Z_{ag} = 1.118 \times 10^{-16} \text{ kg C}^{-1}$

B. $Z_{ag} = 1.118 \times 10^{-6} \text{ kg C}^{-1}$

C. $Z_{ag} = 0.1118 \times 10^{-6} \text{ kg C}^{-1}$

D. $Z_{ag} = 11.18 \times 10^{-6} \text{ kg C}^{-1}$

Ans.: B

Q. 9 "If same charge is passed through different electrolysis then the masses of the substances liberated at different electrodes are proportional to the chemical equivalent of the substances." This statement is given by_____.

A. Gauss's law

B. Faraday's 1st laws of electrolysis

C. Faraday's laws of electromagnetic induction

D. Faraday's 2nd laws of electrolysis

Ans.: D

Q. 10 Faraday's constant is equal to the charge required to liberate the mass of substance at an electrode equal to its _____ during electrolysis.

- A. Atomic weight
- B. Atomic mass
- C. chemical equivalent
- D. all of the above

Ans.: C

Q. 11 Value of Faraday's constant is equal to _____.

- A. 96500 Coulomb
- B. 95600 Coulomb
- C. 9560 Coulomb
- D. 9650 Coulomb

Ans.: A

Q. 12 One ampere of current is defined as that constant current which will deposit ____ kg of silver at the cathode of Ag – voltmeter in one second.

- A. 0.1118×10^{-6} kg
- B. 1.118×10^{-6} kg
- C. 11.18×10^{-6} kg
- D. 1118×10^{-6} kg

Ans.: B

Q. 13 The plates of a lead acid battery are made of _____.

- A. Cast antimonial lead alloy
- B. rolled zinc copper alloy
- C. nickel cadmium alloy
- D. None of the above

Ans.: A

CHAPTER-3 : GENERATING SYSTEM

D.C. MACHINES

[1] Voltage equation of a dc motor is

A. $V = E_b + I_a R_a$

B. $E_b = V + I_a R_a$

C. $V = E_b / I_a R_a$

D. $V = E_b + I_a^2 R_a$

[2] Both Hopkinson's test and Field test

A. Require two electrically coupled series motors

B. **Need two similar mechanically coupled motors**

C. Use negligible power

D. Are regenerative tests

[3] which of the following motor has the constant speed?

A. Series motor

B. **Shunt motor**

C. Cumulatively compound motor

D. All of the above

[4] The usual test to find the efficiency of the traction motor is

A. **Field's test**

B. Retardation test

C. Hopkinson's test

D. Swinburn's test

[5] A DC series motor is best for driving

A. Lathes

B. **Cranes and hoists**

C. Shears and punches

D. Machine tools

[6] Retardation test on a dc shunt motor is used for finding

A. **Stray loss**

B. Copper loss

C. Friction loss

D. Iron loss

[8] One of the main advantage of the swinburn's test is

- A. It is applicable both shunt and compound motors
- B. It needs one running test

C. It is very economical and convenient

- D. It ignores any change in iron loss
- E.

[9] the main disadvantage of hopkinson's test for finding efficiency of shunt dc motors is that it

- A. Requires full load power
- B. Ignores any change in iron loss
- C. Needs one motor and one generator

D. Requires two identical shunt machines

E.

[10] The most economical method of finding no losses of a large dc shunt motor is

- A. Hopkinson's test

B. Swinburn's test

- C. Retardation test
- D. Field's test

CHAPTER-4 : ALTERNATOR

ALTERNATOR

1. Why a 3-phase synchronous motor will always run at synchronous speed?

Because of the magnetic coupling between the stator poles and rotor poles the motor runs exactly at synchronous speed.

2. What are the two classification synchronous machines?

The classification synchronous machines are:

- i. Cylindrical rotor type
- ii. Salient pole rotor type

3. What are the essential features of synchronous machine?

- i. The rotor speed is synchronous with stator rotating field.
- ii. Varying its field current can easily vary the speed.
- iii. It is used for constant speed operation.

4. Mention the methods of starting of 3-phase synchronous motor.

- a. A D.C motor coupled to the synchronous motor shaft.
- b. A small induction motor coupled to its shaft. (Pony method)
- c. Using damper windings –started as a squirrel cage induction motor.

5. What are the principal advantages of rotating field system type of construction of synchronous machines?

- Form Stationary connection between external circuit and system of conditions enable the machine to handle large amount of volt-ampere as high as 500 MVA.
- The relatively small amount of power required for field system can be easily supplied to the rotating field system via slip rings and brushes.
- More space is available in the stator part of the machine for providing more insulation to the system of conductors.
- Insulation to stationary system of conductors is not subjected to mechanical stresses due to centrifugal action.

6. Write down the equation for frequency of emf induced in an alternator.

$$F = PN / 120 \text{ Hertz}$$

Where P = No. Of poles

N = Speed in rpm.

7. What are the advantages of salient pole type of construction used for synchronous machines?

- ❖ They allow better ventilation.
- ❖ The pole faces are so shaped radial air gap length increases from the pole center to the pole tips so that flux distribution in the air gap is sinusoidal in shape which will help to generate sinusoidal emf.
- ❖ Due the variable reluctance, the machine develops additional reluctance power, which is independent of excitation.

8. Why do cylindrical rotor alternators operate with steam turbines?

Steam turbines are found to operate at fairly good efficiency only at high speeds. The high- speed operation of rotor tends to increase mechanical losses, so the rotors should have smooth external surface. Hence smooth cylindrical type rotors with less diameter and large axial length are used for synchronous generators driven by steam turbines with either 2 or 4 poles.

9. Which type of synchronous generators are used in Hydroelectric plants and why?

As the speed of operation is low, for hydro turbines used in hydroelectric plants, salient pole type synchronous generators are used. These allow better ventilation and also have other advantages over smooth cylindrical type rotor.

10. What is the relation between electrical degree and mechanical degree?

Electrical degree θ_e and mechanical degree are related to one another by the number of poles P, the electrical machine has, as given by the following equation.

$$\theta_e = (P/2) \theta_m$$

11. What is the meaning of electrical degree?

Electrical degree is used to account the angle between two points in rotating electrical machines. Since all electrical machines operate with the help of magnetic fields, the electrical degree is accounted with reference to the polarity of magnetic fields. 180 electrical degrees is accounted as the angle between adjacent North and South poles

12. Why short-pitch winding is preferred over full pitch winding? Advantages: -

- Waveform of the emf can be approximately made to a sine wave and distorting harmonics can be reduced or totally eliminated.
- Conductor material, copper is saved in the back and front-end connections due to less coil span.
- Fractional slot winding with fractional number of slots/phase can be used which in turn reduces the tooth ripples.
- Mechanical strength of the coil is increased.

13. Write down the formula for distribution factor.

$$K_d = \frac{\sin(m\beta/2)}{m\sin(\beta/2)}$$

m - number of slots/pole/phase

β - angle between adjacent slots in electrical degree n - order of harmonics.

14. Define winding factor.

The winding factor K_w is defined as the ratio of phasor addition of emf induced in all the coils belonging to each phase winding of their arithmetic addition.

15. Why are alternators rated in kVA and not in kW?

16. What are the causes of changes in voltage of alternators when loaded?

- Voltage variation due to the resistance of the winding R.
- Voltage variation due to the leakage reactance of the winding X_1 .
- Voltage variation due to the armature reaction.

17. What is meant by armature reaction in alternators?

The interaction between flux set up by the current carrying armature conductors and the main field flux is defined as the armature reaction.

18. What do you mean by synchronous reactance?

It is the sum of the leakage reactance X_1 and armature reactance X_a $X_s = X_1 + X_a$

19. What is effective resistant [R_{eff}]?

The apparent increase in resistance of the conductor when an alternating current is flowing through it is known as effective resistance.

20. What is synchronous impedance?

The complex addition of resistance R and synchronous reactance jX_s is synchronous impedance Z_s .

$$Z_s = (R + jX_s) = Z_s \angle \theta \text{ Where } \theta = \tan^{-1}(X_s/R)$$

$$|Z_s| = \sqrt{R^2 + X_s^2}$$

21. What is meant by load angle of an alternator?

The phase angle introduced between the induced emf phasor E and terminal voltage phasor V during the load condition of an alternator is called load angle. The load angle increases with increase in load. It is positive during generator operation and negative during motoroperation.

22. Define the term voltage regulation of alternator.

It is defined as the change in terminal voltage from no load-to-load condition expressed as a function or terminal voltage at load condition, the speed and excitation conditions remaining same.

$$\% \text{ Regulation} = (E - V)/V \times 100$$

23. What is the necessity for predetermination of voltage regulation?

Most of the alternators are manufactured with large power rating and large voltage ratings. Conduction load test is not possible for such alternators. Hence other indirect methods of testing are used and the performance can be predetermined at any desired load currents and power factors.

24. Why is the synchronous impedance method of estimating voltage regulation considered as pessimistic method?

Compared to other methods, the value of voltage regulation obtained by this method is always higher than the actual value and therefore is called pessimistic method.

25. Why is the MMF method of estimating the voltage regulation is considered as the optimization method?

Compared to EMF method, MMF method involves more number of complex calculation steps. Further the OCC is referred twice and SCC is referred once while predetermining the voltage regulation for each load condition. Reference of OCC takes core saturation effect. As this method requires more effort, the final result is very close to the actual value. Hence this method is called the optimistic method.

LONG QUESTION

1. Describe with neat sketches the constructional details of a salient pole type alternator.
2. Draw a neat sketch showing the various parts of a synchronous machine. State the type of synchronous generator used in nuclear power stations.
3. Discuss briefly the load characteristics of alternator for different power factor.
4. Explain any one method of predetermining the regulation of an alternator.
5. Explain why the potier reactance is slightly higher than leakage reactance. 6. Explain dark lamp method of synchronizing an alternator with the bus bar. 7. Explain Blondel's two-reaction theory,
8. Explain how will you determine the d and q axes reactance of a synchronous machine in your laboratory.
9. Derive an expression for synchronizing power.
10. For a salient pole synchronous machine, derive an expression for power developed as a function of load angle.
11. Explain the operating principle of three-phase alternator.

CHAPTER-5 : IGNITION SYSTEM

1. What are the requirements of a sparkplug?
2. What is an Electronic ignition system ?)

The ignition system , in which the mechanical contact points are replaced by electronic triggering and switching devices , is known as electronic ignition system.

3. What is the function of an ignition system in I.C engine

The function of an ignition system is to ignite the air-fuel mixture at the end of the compression stroke.

4. With a neat sketch explain the working of a battery coil and magneto coil ignition system

5. What are the functions of a spark.

6. Explain the working principle of electronic ignition system

7. Discuss the merits and demerits of electronic ignition system.

8-In Battery coil ignition system, the correct sequence of flow of current is

(A) Battery – Ammeter – Ignition coil – Distributor – Spark plug

(B) Battery – Ignition coil – Ammeter – Distributor – Spark plug

(C) Battery – Ammeter – Distributor – Ignition coil – Spark plug

(D) Battery – Distributor – Ammeter – Ignition coil – Spark plug (Ans: A)

9-The induction coil steps up low voltage current of 6 or 12 volts to high voltage current up to about

(A) 10,000 volts

(B) 17,000 volts

(C) 25,000 volts

(D) 35,000 volts (Ans: C)

10-In ignition coil, the ratio between the number of turns of primary and secondary windings is about

(A) 1 to 50

(B) 1 to 100

(C) 1 to 200

(D) 1 to 400 (Ans: B)

11-The distributor serves the following purposes in the ignition system

(A) It operates break and make mechanism

(B) It distributes high tension current to spark plug at correct time

(C) both (A) and (B)

(D) None of the above

(Ans: C)

12-The drive shaft in distributor is rotated at ____ the engine speed in four stroke engine

(A) half

(B) equal to

(C) one and half times

(D) double

(Ans: A)

13-The _____ provides a reservoir for the current induced in the primary circuit at the time of break.

(A) induction coil

(B) distributor

(C) condenser

(D) governor

(Ans: C)

14-The following affect the voltage required to jump over the gap of spark plug

(A) Shape of electrode forming gap

(B) The conductivity of gases in the gap

(C) Fuel-air mixture ratio existing in the gap

(D) All of the above

(Ans: D)

15-In Magneto Ignition system

(A) No battery is required

(B) Engine starting is rather difficult

(C) used in high speed engines

(D) All of the above

(Ans: D)

16-In four cylinder in-line engine, the probable firing order is

(A) 1-3-4-2

(B) 1-2-3-4

(C) 2-4-1-3

(D) 2-1-3-4

(Ans: A)

17-The following is known as 'Breakerless Ignition system'

(A) Battery coil ignition system

(B) Magneto Ignition system

(C) Electronic Ignition system

(D) Capacitive discharge Ignition system

(Ans: C)

18-A solid state switch, known as Thyristor is employed in

(A) Battery coil ignition system

(B) Magneto Ignition system

(C) Electronic Ignition system

(D) Capacitive discharge Ignition system

(Ans: D)

19-The following is (are) the advantage(s) of Electronic Ignition system

(A) Produces maximum output voltage

(B) Better starting with cold engine

(C) Less possibility of arcing at spark plug

(D) All of the above

(Ans: D)

CHAPTER-6 : LIGHT

1. What is Head Light ?
2. What is Fog Light ?
3. What are the types of Light used in Modern Vehicle ?
4. Explain about the Aiming of Head Lights ?
5. Differentiate between Parking Light and Stop Light ?
6. What is the function of Indicator Light in the Vehicle ?
7. What is the function of Tail & Stop Light ?
8. Explain the Wiring diagram of Head Lamp ?

CHAPTER-7 : ACCESSORIES & CONTROL

1. Explain with neat sketch Electric Horn ?
2. What do you mean by Fuel Gauge , Water Temperature Gauge ?
3. Explain about the Electric horn circuit with neat Sketch ?
4. What is the function of Screen Wiper in the Vehicle ?
5. Explain the Wiring Diagram of Electric Horn ?

CHAPTER-8 : WIRING SYSTEM

THANK YOU