



**KERALA AGRICULTURAL UNIVERSITY**  
**B.Tech.(Agrl. Engg.) 2020 Admission**  
**III Semester Final Examination-March 2022**

**Fpme.2105**

**Electrical Machines and Power Utilization (2+1)**

**Marks: 50**  
**Time: 2 hours**

**I Fill in the blanks**

**(10x1=10)**

1. If area of cross section of a coil \_\_\_\_\_ then the inductance will increase.
2. The purpose of performing \_\_\_\_\_ circuit test on a transformer is to measure copper loss.
3. The DC series generator has \_\_\_\_\_ voltage regulation.
4. When load is placed on a 3-phase induction motor, rotor slip \_\_\_\_\_.
5. At \_\_\_\_\_, power factor of series RLC circuit is unity.
6. The starting torque of a slip ring motor is maximum when \_\_\_\_\_.
7. In parallel RLC circuit, impedance at resonance is \_\_\_\_\_.

**State True or False**

8. The gross mechanical power developed by a DC motor is maximum when back emf is equal to half the applied voltage.
9. A single-phase induction motor is self-starting.
10. In a DC generator, the emf is directly proportional to the pole flux.

**II Write short notes on ANY FIVE of the following**

**(5x2=10)**

1. With the help of neat diagrams, explain classification of Transformers with respect to construction.
2. Explain the working principle of a single-phase Transformer.
3. Explain briefly the concept of double field revolving theory in case of single-phase induction motor.
4. State Faraday's and Len's laws of electromagnetic induction.
5. What are the factors that are used to control the speed of DC shunt motor?
6. What is the relation between torque and slip of an induction motor?
7. A capacitor is connected in parallel with a coil having  $L = 5.52 \text{ mH}$  and  $R = 10 \Omega$  to a 100V, 50 Hz supply. Calculate the value of the capacitance for which the current taken from the supply is in phase with voltage.

**III Answer ANY FIVE of the following.**

**(5x4=20)**

1. Difference between electrical circuit and magnetic circuit
2. Explain with help of diagram the equivalent circuit of single-phase induction motor without core loss.
3. Discuss two wattmeter method for the measurement of three-phase power.
4. Explain commutation in DC machines.
5. Derive an expression for starting torque and condition for maximum starting torque of a three-phase induction motor
6. The maximum flux density in the core of 250/3000 volts, 50Hz single phase transformer is  $1.2 \text{ Wb/m}^2$ . If the emf per turn is 8 V, determine
  - (i) primary and secondary turns
  - (ii) area of the core
7. Explain 3-point starter required to start a DC motor.



**IV**

**Write an essay on ANY ONE of the following**

**(1x10=10)**

1. The corrected instrument readings obtained from open and short circuit tests on 10 kVA, 450/120 V, 50 Hz transformer are:

O.C. test:

$V_1 = 120 \text{ V}$ ;  $I_1 = 4.2 \text{ A}$ ;  $W_1 = 80 \text{ W}$ ;  $V_1$ ,  $W_1$  and  $I_1$  were read on the low voltage side.

S.C. test:

$V_1 = 9.65 \text{ V}$ ;  $I_1 = 22.2 \text{ A}$ ;  $W_1 = 120 \text{ W}$  – with low voltage winding short circuited.

Compute the equivalent circuit (approximate) constants.

2. Explain  $T_a/I_a$ ,  $N/I_a$  and  $N/T_a$  characteristics of DC series and Shunt motor.

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