



**KERALA AGRICULTURAL UNIVERSITY**  
**B.Tech. (Agrl. Engg.) 2018 Admission**  
**III Semester Final Examination-December-2019**

**Fpme.2105**

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

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

**I Fill in the Blanks (10x1=10)**

1. The main purpose of performing open circuit test on a transformer is to measure its \_\_\_\_\_
  2. The value of coefficient of coupling  $k$  for tightly coupled coils is \_\_\_\_\_.
  3. If the flux/field related to shunt motor is decreased then the speed of the motor will \_\_\_\_\_
  4. The capacitor in a capacitor start induction run AC motor is connected in series with \_\_\_\_\_ winding.
  5. In series RLC circuit current at resonance is \_\_\_\_\_.
  6. In 3-phase star connected system, the relationship between line voltage and phase voltage is given as \_\_\_\_\_.
  7. In 3-phase star connected system, the line voltages are \_\_\_\_\_ degree ahead of their respective phase voltages.
- State True or False**
8. Series motor requires huge starting torque as compared to shunt motor.
  9. In case of 3-phase induction motor, maximum torque varies inversely as the applied voltage.
  10. In an ideal transformer, the no-load primary current  $I_0$  lags behind  $V_1$  by  $90^\circ$ .

**II Write Short notes on ANY FIVE of the following (5x2=10)**

1. A single phase transformer has 400 primary and 1000 secondary turns. The net cross sectional area of the core is  $60 \text{ cm}^2$ . If the primary winding be connected to a 50 Hz supply at 520 V, calculate (i) the voltage induced in the secondary winding and (ii) the peak value of flux density in the core.
2. What is armature reaction in case of DC generator?
3. What are the disadvantages of low power factor?
4. What is the principle of operation of induction motor?
5. A 4-pole, 220V shunt motor has 540 lap wound conductors. It takes 32A from the supply mains and develops output power of 5.595 kW. The field winding takes 1A. The armature resistance is  $0.9\Omega$  and the flux per pole is 30 mWb. Calculate the speed of the motor.
6. Why transformer rating is in kVA?
7. What is the function of commutator in DC motor?

**III Answer ANY FIVE of the following. (5x4=20)**

1. a. A 2200/200V transformer draws a no-load primary current of 0.6A and absorbs 400W. Find the magnetizing and iron loss currents.  
b. A 2200/250V transformer takes 0.5A at a p.f. of 0.3 on open circuit. Find magnetizing and working components of no-load primary current.
2. Discuss in detail speed control methods of DC shunt motor.
3. Derive an expression for maximum torque of polyphase induction motor under running condition.
4. Explain in detail parallel resonance in RLC circuit graphically.
5. Explain the equivalent circuit of transformer in detail.

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6. Discuss the no-load saturation ( $E_0/I_f$ ) and load saturation ( $V/I_f$ ) characteristics of DC generator.
7. A 220 V dc shunt motor runs at 500rpm when the armature current is 50 A. Calculate the speed if the torque is doubled. Given that  $R_a = 0.2 \Omega$ .

**IV Answer ANY ONE of the following**

**(1x10=10)**

1. a. The input power to a three phase motor was measured by two wattmeter method. The readings were 10.4 KW and - 3.4 KW and the voltage was 400 V. Calculate (i) The power factor (ii) the line current.  
b. A coil having an inductance of 50 mH and resistance  $10 \Omega$  is connected in series with a  $25 \mu\text{F}$  capacitor across a 200 V ac supply. Calculate (i) resonance frequency of the circuit (ii) current flowing at resonance and (iii) value of  $Q_0$ .
2. a. Write a short note on capacitor start and shaded pole single phase induction motors.  
b. Explain various methods of power factor improvement.

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