



KERALA AGRICULTURAL UNIVERSITY  
B.Tech.(Ag. Engg.) 2016 Admission  
III Semester Final Examination-January-2018

Fpme.2105

Electrical Machines and Power Utilization (2+1)

Marks: 50

Time: 2 hours

(10x1=10)

**I Fill in the Blanks**

- 1 If the area of cross section A of a solenoid increases then reluctance of the material will---
- 2 The main purpose of performing short circuit test on a transformer is to measure its-----
- 3 The -----generator has poorest voltage regulation.
- 4 When load is placed on a 3-phase induction motor, its rotor torque-----
- 5 Power factor of series RLC circuit at resonance is-----
- 6 In parallel RLC circuit impedance at resonance is-----
- 7 The starting torque of a slip ring motor is maximum when-----

**State True or False**

- 8 The gross mechanical power developed by a 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 generated emf is directly proportional to the pole flux.

**II Answer any FIVE of the following**

(5x2=10)

- 1 Explain the working principle of a Transformer.
- 2 A four pole generator, having lap wound armature winding has 51 slots. Each slot containing 20 conductors. What will be the voltage generated in the machine when driven at 1500 rpm assuming the flux per pole to be 7 mWb?
- 3 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.
- 4 Explain briefly the concept of double field revolving theory in case of single phase induction motor.
- 5 Explain the Faraday's laws of electromagnetic induction.
- 6 What are the factors that are used for controlling the speed of DC motor?
- 7 What is the effect of rotor resistance on the starting torque of induction motor?

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

(5x4=20)

- 1 A 30 kVA, 6000/230 V single phase transformer has the following parameters:  
Primary winding resistance =  $10 \Omega$   
Secondary winding resistance referred to primary =  $10.8 \Omega$   
Primary winding leakage reactance =  $16 \Omega$   
Secondary winding leakage reactance referred to primary =  $18 \Omega$   
Calculate, neglecting no-load current, the voltage to be applied to the primary to circulate full-load current when the secondary is short circuited. What is the power factor on short circuit?
- 2 Explain with help of diagram the equivalent circuit of single phase induction motor with and without core loss.
- 3 Discuss in detail two wattmeter method of three phase power measurement.
- 4 Discuss the methods of improving commutation for DC generator.
- 5 Derive an expression for starting torque of polyphase induction motor and write its maximum condition.

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- 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 volt, determine  
 (i) primary and secondary turns  
 (ii) area of the core.
- 7 Explain 3-point starter required to start DC motor.

**IV Answer any ONE of the following (1x10=10)**

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

- a 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.
- 1 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.
- b Explain an ideal Transformer and derive an expression for EMF of a Transformer.
- 2 a Explain the working principle of Motor. What is the significance of the back EMF in DC motor?  
 b Explain  $T_a/I_a$ ,  $N/I_a$  and  $N/T_a$  characteristics of DC series motor.

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