

KERALA AGRICULTURAL UNIVERSITY

B.Tech (Agrl.Engg) 2012 Admission
Vth Semester Final Examination- January -2014

Cat. No: Fpme.3111

Title: Electrical Machines and Power Utilization (2+1)

Marks: 80
Time: 3 hours

Answer All Questions

I. Fill in the blanks

(10x1=10)

1. Permeance in Magnetic circuit corresponds toin Electric circuit.
2. Transformer cores are laminated to reduce
3. Wattmeter reading in the S.C test of the transformer practically gives its
4. Number of parallel paths in Lap winding is equal to.....
5. Current drawn by 120V DC motor of armature resistance 0.5 ohms and back emf 110V is
6. Internal characteristics of DC generator is the plot between.....and.....
7. In a three phase induction motor having $N_s=1500$ rpm and running with $s=0.04$, rotor speed is.....rpm.
8. When applied rated voltage is reduced by half, starting torque of squirrel cage induction motor became.....of the starting torque with full voltage.
9. In a single phase induction motor, if the slip of the rotor is S with respect to the forward rotating flux, then its slip with respect to the backward rotating flux is.....
10. One wattmeter shows zero reading and other shows positive value in two wattmeter method, when its pf is.....

II. Write short notes on any TEN

(10x3=30)

1. What you meant by hysteresis and eddy current losses in a magnetic circuit
2. What is the principle of operation of a transformer?
3. Derive the emf equation of a transformer.
4. What is O.C test of transformer.
5. Compare Lap and wave windings in a DC machine.
6. What is demagnetizing and cross magnetizing effect of armature reaction.
7. Define voltage regulation. If a machine is having low voltage regulation, what is your inference about the quality of the machine?
8. What is the principle of operation of DC motor?
9. What you meant by stand still torque and running torque of induction motors.

10. What is the effect of variation of rotor resistance in the torque-slip curve of induction motor?
11. Draw the torque-slip curve of single phase induction motor.
12. What are the disadvantages of low power factor?

III

Answer any SIX of the following.

(6x5=30)

1. Draw the no load and on load phasor diagrams of a single phase transformer.
2. A 230/460-V transformer has a primary resistance of 0.2 ohms and reactance of 0.5 ohms and the corresponding values for the secondary are 0.75 ohms and 1.8 ohms respectively. Find the secondary terminal voltage when supplying 10A at 0.8 p.f lagging.
3. A 4-pole, long shunt lap wound generator supplies 25Kw at a terminal voltage of 500V. The armature resistance is 0.03 ohms, series field resistance is 0.04 ohms and shunt field resistance is 200 ohms. The brush drop is 1.0V. Determine the emf generated.
4. Why we need starter in DC motors. Explain the operation of four-point starter.
5. Explain the theory of rotating magnetic field in AC machines
6. Explain star/delta starting of induction motors.
7. Explain double field revolving theory of single phase induction motors?
8. Explain two wattmeter method of power measurement.

IV

Answer any ONE of the following

(10x1=10)

1. a) Explain the construction and operation of a DC machine.
 b) 250V shunt motor on no load runs at 1000 rpm and takes 5A. Armature and shunt field resistances are 0.2 and 250 ohms respectively. Calculate the speed when loaded taking a current of 50A. Armature reaction weakens the field by 3%.
2. a) Draw the equivalent circuit of an induction motor. What are the different losses and power stages in an induction motor.
 b) A 400V, 50Hz, 6-pole, delta connected, 3 phase induction motor consumes 75Kw with a line current of 75A and runs at a slip of 2.5%. If stator iron loss is 2 Kw, windage and friction loss is 1.2Kw and resistance per phase is 0.16 ohms, calculate
 i) Power supplied to the rotor ii) Rotor Cu loss, iii) Power supplied to load,
 iv) Efficiency and v) Shaft torque developed.