II B. Tech II Semester Regular Examinations April/May 2009
ELECTRICAL MACHINES - II
(Electrical and Electronics Engineering)

Time: 3 Hours   Max. Marks: 80

Answer any FIVE questions.
All questions carry equal marks
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1.   (a) State and Explain the Principle of operation and constructional details of single-phase transformer.

(b) A 1 – phase transformer has 500 turns in the primary and 1200 turns in the Secondary. The cross – sectional area of the core is 80 sq.cm. If the primary winding is connected to a 50 HZ supply at 500 V, Calculate (i) peak flux density and (ii) Voltage induced in the Secondary.

2. (a) How does a transformer can be resolved into an equivalent circuit?

(b) A 600 KVA, 1- Phase transformer when working at u.p.f has an efficiency of 92% at full load and also at half-load. Determine its efficiency when it operates at unity p.f and full load.

3. (a) Explain the requirements for parallel operation of 1 – phase transformers.

(b) Two 1 – phase transformers A and B rated at 250 KVA each are operated in parallel on both sides. Percentage impedances for A and B are (1 + j6) and (1.2 + j 4.8) respectively. Compute the load shared by each when the total load is 500 KVA at 0.8 p.f lagging.

4. Discuss various possible poly phase connections in poly phase transformers.

5. (a) Obtain the expression for slip and frequency of rotor current.

(b) A 4 – pole, 3 – phase induction motor operates from a supply whose frequency is 50 HZ. Calculate.

(i) The speed at which the magnetic field of the stator is rotating.

(ii) The speed of the rotor when the slip is 0.04

(iii) The frequency of the rotor currents when the slip is 0.03

(iv) The frequency of the rotor currents at stand still.

6. (a) Show that when a 3 – phase supply is given to the stator winding of induction motor, it produces a rotating magnetic field of constant magnitude and rotating at synchronous speed.

    (b) A 12 – pole, 3 – phase induction motor is fed from 100HZ supply. If the frequency of rotor e.m.f at full load is 5HZ, find the full–load speed and percentage slip.

7. Discuss the no load test and blocked rotor test conducted in 3-phase induction motors.

8. Write short notes on the following

    a) Double field revolving theory

    b) capacitor start and run motor.

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1. (a) Derive the e.m.f equation of a 1 – phase transformer.

   (b) A 3000 / 200 V, 50 HZ, 1 – phase transformer is built on a core having an effective cross – sectional area of 150 cm^2 and has 80 turns in the low voltage winding. Calculate

   (i) the value of the maximum flux density in the core.

   (ii) the number of turns in the high voltage winding.

2. (a) Obtain the equivalent circuit of a 1 – phase transformer.

   (b) A 600 KVA, 1 – phase transformer has an efficiently of 92% both at full load and half load at unity power factor. Determine its efficiency at 60% of full load at 0.8 p.f lag.

3. A 230 V/230 V, 3 KVA transformer gave the following results:

   O.C test : 230 V, 2A, 100 W

   S.C test: 15 V, 13 A, 120 W

   Determine the regulation and efficiency at full load 0.8 p.f lagging.

4. Discuss the production of rotating magnetic field in 3 – phase induction motors.

5. A 3 – phase, 50 HZ transformer has a delta – connected primary and star – connected secondary, the line voltages being 22000 V and 400 V respectively. The secondary has a star connected balanced load at 0.8 p.f lagging.

6. (a) Discuss various power stages in induction motor

   (b) A 3 – phase induction motor is wound for 4 poles and is supplied from 50 HZ system. Calculate (i) the synchronous speed (ii) the rotor speed. When slip is 4% and (iii) rotor frequency when rotor runs at 600 rpm.

7. (a) Discuss the working of rotor resistance starter.

   (b) Discuss the speed control methods of induction motor by pole changing and frequency changing

8. Write short notes no the following

   a) Double field revolving theory

   b) Capacitor start and run 1- phase induction motor

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1. a) Explain the Principle of operation of of single phase transformer.

   b) The number of turns on the primary and secondary windings of a 1-phase transformer are 350 and 35 respectively. If the primary is connected to a 2.2 KV, 50HZ supply, Determine the secondary voltage on no-load.

2. a) Obtain the total equivalent circuit of a 1- phase transformer

   b) In a 25KVA, 2000/200 V, 1- phase transformer the iron and load full load copper losses are 350 and 400W respectively. Calculate the efficiency at unity p.f on

   i) Full load ii) half full load.

3. a) Discuss the condition for parallel operation of 1- phase transformers.

   b) Two 1- phase transformers with equal turns have impedances of (0.5+j3)ohm and (0.6 +j 10) ohm with respect to the secondary. If they operate in parallel, determine how they will share a total load of 100 KW at p.f 0.8 lagging.

4. Explain the Scott connection or T-T connection for 3-phase to 2-phase to transformation.

5. How does a rotating magnetic field set up in a 3- phase induction motor to rotate the motor. Explain.

6. a) Derive the expression for torque developed in Induction motor .

   b) The power input to rotor of a 440V, 50HZ, 3-phase 12pole Induction motor is 75W. The rotor e.m.f has a frequency of 2 Hz. Calculate. i) slip ii) rotor speed iii) rotor copper loss iv) mechanical power developed .

7. a) Explain the operation of Star Delta starter with a neat sketch .

   b) How the cascade connection helps in controlling the speed of an Induction motor? Explain.

8. Write short notes on the following.

   a) Capacitor start and run 1- phase Induction motor

   b) Blocked Rotor Test.

Code No: 3220204

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1. a) Obtain e.f.m. equation of a transformer from the fundamentals.

    b) A 1-phase transformer has 500 primary and 1200 secondary turns . The net cross section area the core is 75 sq.cm. If the primary winding be connected to a 400V ,50HZ supply. Calculate

    i) The peak value of flux density in the core and ii)Voltage induced in the secondary winding

2. a) Draw the equivalent circuit of a 1-phase transformer.

    b) A 1-phase transformer, working at unity p.f has an efficiency of 90% at both half load and a full-load of 500KW. Determine the efficiency at 75% of full-load.

3. Explain the O.C and S.C test for 1-phase transformers.

4. Discuss the Open-delta and Scott connections in 3-phase transformers.

5. Explain the term slip in 3 – phase induction motors and explain the torque –slip Characteristics of induction motors

6. Explain the power stages of a 3 – phase induction motor and deduce the relationship between copper loss, mechanical power developed and air gap power of an Induction motor.

7. Explain the importance of NO-load test and Blocked rotor tests in 3- phase induction motors. How they are conducted?

8. Write short notes no the following

    a) Double field revolving theory

    b) Star-Delta starter