GANPAT UNIVERSITY
B.TECH SEM-III ELECTRICAL ENGINEERING
REGULAR EXAMINATION NOV / DEC – 2013
2EE 305: ELECTRICAL MACHINE-I

Time: 3 Hours   Totalmarks: 70

Instruction: - 1 Attempt all questions.
2 Make suitable assumptions wherever necessary.
3 Figures to the right indicate full marks

SECTION - I

Q - 1 (A) Derive the E.M.F. equation of single phase transformer [3]

(B) Explain open and short circuit test for single phase transformer. While making short circuit test, Low voltage winding is always short circuited. Why? [5]

(C) A 3000/200 V, 50 Hz, 1 – phase transformer is to be operated at a maximum flux density of 1.2 Wb/m^2 in the core. The effective cross sectional area of the transformer core is 150 cm^2. Calculate suitable values of primary and secondary turns. [4]

OR

Q - 1 (A) Explain different losses occurs in the transformer and derive the condition for maximum efficiency. [6]

(B) A 10 KVA, 440/3300 V, 3 phase transformer when tested on open circuit, gave the following figures on the primary side: 440 V; 1.3 A; 115 W. When tested on short circuit with full load current, the power input was 140 W. Calculate the efficiency of the transformer at (a) full load at unity power factor. (b) one quarter full load 0.8 power factor. [6]

Q - 2 (A) Derive the equation of torque under running condition for three phase induction motor. Also derive the condition for maximum torque under running condition [6]

(B) The star connected rotor of a 3- phase induction motor has a resistance and reactance of 0.4 Ω/phase and 2.5 Ω/phase respectively. The emf induced between slip ring at standstill is 80 V, the stator being connected to normal supply voltage. Find the rotor current and power factor at starting when the slip rings are (i) short circuited (ii) joined to a star connected resistance of 5 Ω/phase. [5]

OR

Q - 2 (A) Explain torque and slip characteristics of three phase Induction Motor [4]

(B) Discuss the effect of variations in voltage and frequency on the performances of a 3-phase induction motor. [4]

(C) An 8 pole alternator runs at 750 rpm and supplies power to a 6 pole induction motor which has at full load a slip of 3%. Find the full load speed of the induction motor and the frequency of its rotor emf. [3]

Q - 3 Answer the following question. Any Three [12]

(A) Discuss the three point starter used in dc motor.

(B) Derive the Equations for Armature torque and Shaft torque for D.C. Motor

(C) Write short notes on an Auto transformer.

(D) Compare squirrel cage induction motor and slip ring induction motor.

SECTION – II

Q - 4 **(A)** Explain the internal and external characteristics of D.C. Shunt Generator. [6]

(B) A shunt generator supplies 195 A at 220 V. Armature resistance is 0.02Ω; shunt field resistance is 44 Ω. If the iron and frictional losses amount to 1600 W, find (i) emf generated, (ii) Cu losses, (iii) b.h.p of the engine, (iv) electrical and commercial efficiency. [6]

OR

Q - 4 **(A)** Explain different losses occurs in D.C generator. [4]

(B) Define following: (i) Pole pitch, (ii) Front pitch, (iii) Coil span and (iv) commutator pitch [4]

(C) A 20 KW compound generator works on full load with a terminal voltage of 230 V. The armature, series and shunt field resistance are 0.1, 0.05 and 115 Ω respectively. Calculate the generated emf when the generator is connected short shunt. [4]

Q - 5 **(A)** Why tap changing transformer required ? Explain off load tap changing transformer. [5]

(B) A 3 phase transformer has 145 turns/phase on each secondary winding and 1382 on each primary winding. The primary side is connected to a 6600 V, 50 Hz, 3 phase supply. Calculate the no load secondary line voltage when the winding are connected (i) star – delta and (ii) delta – star. [6]

OR

Q - 5 **(A)** What is meant by circulating current in parallel operation of transformer. [2]

(B) Show the physical connection and phasor diagram of Dd0 and Yd6 connection [4]

(C) Two single phase transformer with equal voltage ration have impedance of (0.5 + j3) ohm and (0.6 +j10) ohm with respect to the secondary. If they operate in parallel, determine how they share a total load of 100 KW at power factor of 0.8 lagging. [5]

Q - 6 Answer the following question Any Three [12]

(A) Write short notes on scott connection of transformer.

(B) Discuss Armature reaction in dc generator

(C) Explain voltage build up process of DC Generator

(D) Draw the magnetising characteristic of separately excited generator

END OF PAPER