GANPAT UNIVERSITY
B.TECH SEM-III (ELECTRICAL)
REGULAR EXAMINATION DEC-2012
2EE305: ELECTRICAL MACHINE- I

Time: 3 Hours

Total Marks:-70

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

SECTION-I

Q:1 (A) State types of 3-phase induction motor. Explain the speed torque characteristic of a 3-phase induction motor with necessary diagram. [4]

(B) Draw and explain the vector diagrams when transformer is on ON-Load condition. [4]

(C) Why is a starter required in a dc shunt motor? Explain the working of 3-point starter with the help of a neat diagram. [4]

OR

Q:1 (A) Discuss the effect of variations in voltage and frequency on the performances of a 3-phase induction motor. [4]

(B) Explain the direct load test for determination of voltage regulation and efficiency of transformer with necessary diagram. [4]

(C) Derive the expression for the torque developed in the D.C motor. [4]

Q:2 (A) Discuss power stage in induction motor and prove that rotor copper loss is equal to slip time rotor input. [6]

(B) Compare auto transformer with ordinary transformer with necessary diagram. [5]

OR

Q:2 (A) Draw and Explain equivalent circuit of induction motor. [6]

(B) Discuss the essential and desirable condition to be fulfilled for operating two single phase transformer in parallel. [5]

Q:3 Attempt the following: [12]
(A) A 10 KVA, 200/400 V, 50 Hz single phase transformer gave the following test results.
O.C. test (hv winding open)   200V, 1.3A, 120W
S.C.test (lv winding short circuited) 22V, 30A, 200W
Find the parameters from O.C and S.C test.
(B) A three phase induction motor has a starting torque of 150 % and a maximum torque of 250 % of full load torque. Neglect stator resistance and assume constant rotor resistance. Calculate (i) the slip at maximum torque (ii) full load slip and (iii) the rotor current at starting in terms of full load rotor current.
(C) A 220 V, D.C series motor is running at a speed of 800 rpm and draws 100 A. Calculate at what speed the motor will run when developing half the torque. Total resistance of the armature and field is 0.1 ohm. Assume that the magnetic circuit is unsaturated.

SECTION-II

Q:4 (A) Give the comparison of lap and wave winding. [4]

(B) Enumerate all the parts of a D.C. machine and indicate their functions. [4]

(C) A 4-pole generator supplies a current of 143 A. It has 492 armature conductors (a) lap wound (b) wave wound connected. When delivering full load, the brushes are given an actual lead of $10°$. Calculate the demagnetizing ampere turns/pole. This field winding is shunt connected and takes 10A. find the number of extra shunt field turns necessary to neutralize this magnetization [4]

OR

Q:4 (A) Sketch and explain the load characteristics of shunt generator. [4]

(B) What are the advantages and disadvantages of three-phase transformer over an equivalent three-phase bank composed of three single-phase transformer? [4]

(C) A 3-phase step-down transformer is connected to 6600 V on the primary side. The ratio of turns per phase is 12 and the line current drawn from the mains is 20 A. Find the secondary line voltage and secondary line current if the transformer is connected in(i)Y-Δ (ii)Δ − Y [4]

Q:5 (A) Explain scoot connection for three-phase transformer. [4]

(B) A shunt generator delivers 195 A at a power developed of 250 V. The armature resistance and shunt field resistance are 0.02 Ω and 59 Ω respectively. The iron and friction losses equal 950 W. Find (i)e.m.f. generated (ii) Cu losses (iii) output of the prime mover (iv) electrical, mechanical and commercial efficiency. [4]

(C) Draw the vector diagram of (i) Y-Δ (ii) Y-Y. [3]

OR

Q:5 (A) What do you mean by multiplex winding? [3]

(B) The O.C.C of a separately excited d.c. generator driven at 400 r.p.m., is., as follows [4]

Field Current (A)	2	3	4	5	6	7	8	9
e.m.f.(V)	110	155	186	212	230	246	260	271

Find (i) the critical value of shunt field resistance
(ii) the critical speed when the field circuit resistance 34 Ω

(C) Explain the losses of D.C. generator & also get the condition for maximum efficiency. [4]

Q:6 Attempt the following:

(A) Design the armature winding for 4-pole simplex lap winding with 15 slots and 15 segments. Each slot has two coil sides. [6]

(B) What is the function of compensating winding in D.C. machine? Also discuss the term "commutation". [6]

END OF PAPER
Best of Luck