C 31900

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FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2007

EE 2K 405/PTEE 2K 303—ELECTRICAL MACHINES

Time : Three Hours   Maximum : 100 Marks

I. (a) Explain the winding layout of a wave connected armature winding.

   (b) Calculate the distribution factor for a 36-slot, 4-pole, single layer 3-phase winding.

   (c) Classify d.c. machines based on excitation methods.

   (d) A 4-pole generator has wave wound armature with 722 conductors, and it delivers 100 A on full load. If the brush lead is 8° calculate the armature damagnetising and cross-magnetising ampere-terms per pole.

   (e) Draw and explain the load characteristics of d.c. shunt generator.

   (f) Explain the procedure and calculation of efficiency in Swinburne's Test.

   (g) Draw and explain the exact equivalent circuit of loaded transformer.

   (h) Write a short notes on switching transients in transformer.

                                                                                (8 × 5 = 40 marks)

II. (a) (i) Explain the following terms with respect to armature winding of DC machine.

1	Pole pitch.	2	Back pitch.
3	Front pitch.	4	Commutator pitch.

                                                                                            (8 marks)

   (ii) Derive the expression for torque developed in a winding.   (7 marks)

Or

   (b) (i) Write a short notes on MMF in the armature winding.   (7 marks)

   (ii) Draw a developed diagram of a simple 2-layer lap winding for a 4-pole generator with 16 coils. Hence, point out the characteristics of lap winding.

                                                                                            (8 marks)

III. (a) (i) Describe the effects of armature reaction on the operation of dc machines.   (8 marks)

   (ii) An 8-pole wave wound d.c. generator has 480 armature conductors. The armature current is 200A. Find the armature reaction demagnetising and cross-magnetising ampere turns per pole if (1) brushes are on G.N.A. (2) brushes are shifted 6° electrical from G.N.A.

                                                                                            (7 marks)

Or

Turn over

(b) (i) Describe the operation of DC generator with neat sketches. (7 marks)

　　(ii) Explain the methods of improving commutation with relevant figures. (8 marks)

IV. (a) (i) Explain the process of building up of voltage in a dc shunt generator and give the conditions of self build-up voltage.

(8 marks)

　　(ii) Two d.c. shunt generators operating in parallel supply a total load current of 200 A. The terminal voltage of one generator falls uniformly from 240 V to 225 V when delivering 120 A. The terminal voltage of the second generator falls uniformly from 230 V to 215 V when delivering 100 A. Find the load current shared by each generator and the bus-bars voltage.

(7 marks)

Or

(b) (i) Describe the methods of speed control of DC series motor with neat sketches. (8 marks)

　　(ii) A 200 V shunt motor develops an output of 17.158 kW when taking 20.2 kW. The field resistance is 50 Ω and armature resistance is 0.06 Ω. What is the efficiency and power input when the output is 7.46 kN ?

(7 marks)

V. (a) (i) Explain briefly the operation of a transformer and sketch phasor diagram on no-load.

(6 marks)

　　(ii) A 20 kVA, 2200/220 V, 50 Hz distributed transformer is tested for efficiency and regulation as follows :

　　　O.C. test : 220 V, 4.2 A, 148 W – l.v. side

　　　S.C test : 86 V, 10.5 A, 360 W – l.v. side

Determine (i) Core loss ; (2) Equivalent resistance referred to primary ; (3) equivalent resistance referred to secondary ; (4) equivalent reactance referred to primary ; (5) equivalent reactance referred to secondary ; (6) regulation of transformer at 0.8 p.f. lagging current ; (7) efficiency at full-load and half the full load at 0.8 p.f. lagging current.

(9 marks)

Or

(b) (i) Draw the circuit diagram and explain the procedure for conducting Sumpner's test.

(8 marks)

　　(ii) Two single-phase transformers with equal voltage ratio's having impedances of (0.819 + j 2.503) Ω and (0.8 + j 2.31) Ω with respect to the secondary. If they operate in parallel, how they will share a total load of 2000 kN at p.f. 0.8 lagging.

(7 marks)

[4 × 15 = 60 marks]