Student Exam No:-_____

GANPAT UNIVERSITY
B.TECH SEM-III MECHATRONICS ENGINEERING
CBCS REGULAR EXAMINATION NOVEMBER-2014
2EE303:-ELECRICAL MACHINES & DRIVES

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)** Draw and explain torque vs. armature current and speed vs. armature current characteristics for D.C. series motor. **[6]**

(B) List the different types of losses in D.C. generator and also explain all losses in detail. **[6]**

OR

Q:1 **(A)** A 4 pole, lap wound, long shunt, D.C. compound generator has useful flux per pole of 0.07 Wb. The armature resistance is 0.055Ω and it consists of 220 turns. Calculate the terminal voltage if the resistance of shunt field and series field are 100 Ω and 0.02 Ω respectively; when the generator is running at 900 r.p.m with armature current of 50 A. Also calculate the power output in KW for the generator. **[6]**

(B) What is the necessity of a starter in D.C. motor? Explain four point starter in brief. **[6]**

Q:2 **(A)** Describe synchronous motor operation & draw phasor diagram for unity, lagging and leading power factor conditions. **[6]**

(B) List the applications of servomotor. Explain D.C. servomotor in detail. **[5]**

OR

Q:2 **(A)** A 50-KVA, 240 V, 50-Hz, 1-phase alternator has effective armature resistance of 0.02 Ω and an armature leakage reactance of 0.08 Ω. Define the voltage induced in the armature when the alternator is delivering rated current at a load power factor of (i) unity, (ii) 0.8 lagging and (iii) 0.8 leading. **[6]**

(B) Define the step angle in stepper motor. Explain the working of 1-phase-on operation of stepper motor. **[5]**

Q:3 **(A)** What is electrical drive? What are the merits and demerits of electrical drives? **[5]**

(B) Explain working principle of split phase induction motor. **[4]**

(C) Make a comparison between synchronous motor and induction motor. **[3]**

SECTION-II

Q:4 (A) Explain induction motor working principle. How does the rotor of 3-phase induction motor rotate? [5]

(B) What is the main purpose of performing open circuit test on transformer? Explain it in detail. [5]

(C) In a transformer; the core loss is found to be 52 W at 40 Hz and 90 W at 60 Hz measured at same peak flux density. Compute the hysteresis and eddy current losses at 50 Hz. [2]

OR

Q:4 (A) Explain relation between torque and rotor power factor. Derive equations for (i) torque under running condition and (ii) torque under starting condition. [6]

(B) Explain open delta connection and scott connection with necessary diagram & equations. [6]

Q:5 (A) The no-load current of a transformer is 5 A at 0.3 power factor when supplied at 230 V, 50 Hz. The number of turns on the primary winding is 200. Calculate (i) the maximum value of flux in the core (ii) the core loss and (iii) the magnetizing current. [6]

(B) Why the rating of transformer is given in KVA? Derive the condition for maximum efficiency of transformer. [5]

OR

Q:5 (A) Calculate the torque exerted by an 8-pole, 50 Hz, 3-phase induction motor operating with a 4% slip which develops a maximum torque of 150 Kg-m at a speed of 660 r.p.m. The resistance per phase of the rotor is 0.5 Ω. [6]

(B) Explain the working and construction of current transformer and potential transformer. [5]

Q:6 (A) A 250 V, D.C. shunt motor has shunt field resistance of 250 Ω and an armature resistance of 0.25 Ω. For a given load torque and no additional resistance included in the shunt field circuit, the motor runs at 1500 r.p.m. drawing an armature current of 20 A. If a resistance of 250 Ω is inserted in series with the field, the load torque remaining the same, find out the new speed and armature current. Assume the magnetization curve to be linear. [5]

(B) List the classification of electrical drives. Explain any one in details with it's advantages and disadvantages. [4]

(C) What is armature reaction in alternator? Explain the relation between main flux and armature flux during unity power factor, zero power factor lagging and zero power factor leading conditions. [3]

END OF PAPER