Student Exam No._____

GANPAT UNIVERSITY
B.TECH SEM.6th ELECTRICAL ENGINEERING
REGULAR EXAMINATION APRIL-JUNE 2015
2EE604:ELECTRICAL DRIVES

TIME:-3 HOURS **TOTAL MARKS-70**

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

Section-I

Que-1

(a) Describe class B chopper circuit for speed control of DC motor. **(06)**

(b) Draw the circuits and explain the working of single phase semi-converter dc motor drive. **(06)**

OR

Que-1

(a) The temperature rise of an electrical motor after operating for 30 minutes on full load is 20°C. After another 30 minutes on the same load, the temperature rise becomes 30°C. Assuming the temperature rise is as per exponential law, find final temperature rise and time constant. **(06)**

(b) State and explain the important features of various braking methods of dc motors. **(06)**

Que-2

(a) State and explain the functions of various converters. **(06)**

(b) A Separately excited dc motor is fed from a 500 V dc source through a one quadrant chopper. R_a = 0.1 ohm and armature current is 200 A. The voltage and torque constants are 1.4 V/A-rad/sec and 1.4 N-m/A^2.The field current is 2 A. The duty cycle of chopper is 0.5. Find (a) input power, (b) speed, (c) torque. **(05)**

OR

Que-2

(a) A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06 ohm. It is fed from a 1-phase fully controlled rectifier with an ac source voltage of 220 V, 50 Hz. Assuming continuous conduction, calculate **(06)**

a) Firing angle for rated motor torque and 750 rpm.
b) Firing angle for rated motor torque and -500 rpm.
c) Motor speed for α =160° and rated torque.

(b) Derive the equation for temperature rise of a motor. **(05)**

Que-3 **Attempt any three.** **(12)**

(a) Explain State-Space Modeling for Separately Excited DC Motor.

(b) What are the factors influencing the choice of electric drives?

(c) State and explain different methods of speed sensing.

(d) What is the current status of dc and ac drives?

Section-II

Que-4

(a) Discuss the variation of speed torque characteristics of an Induction motor when fed by VVVF source. Show how the operation is similar to that of armature voltage control (below the base speed) and field control (above the base speed) for a DC motor. **(06)**

(b) A 3-phase, 400V, 6- pole, 50 Hz, delta-connected, slip-ring induction motor has rotor resistance of 0.2 ohm and leakage reactance of 1 ohm per phase referred to stator. When driving a fan load it runs at full load at 4% slip. What resistance must be inserted in the rotor circuit to obtain a speed of 850 rpm. Neglected stator impedance and magnetizing branch. Stator to rotor turns ratio is 2.2. **(06)**

OR

Que-4

(a) Derive the expression for torque of a cylindrical wound field motor with the help of equivalent circuit and neat phasor diagram. **(06)**

(b) A 500 kW, 3-phase,3.3 kv,50 Hz, 0.8(lagging) power factor,4pole,star connected synchronous motor has following data: X_S=15 Ω, R_S=0. Rated field current is 10 A. Calculate **(06)**

a) Armature current and power factor at half the rated torque and rated current.

b) Field current to get unity power factor at the rated torque.

Que-5

(a) Why a transformer is desired in a Static Scherbius drive? Comment on the power factor of the drive in this method and hence, mention the criteria for maximizing the power factor. **(06)**

(b) With the help of circuit diagram and waveforms, explain the working of a Sinusoidal permanent magnet synchronous motor drive. **(05)**

OR

Que-5 **(a)** Discuss operation of IM under Non-Sinusoidal voltage supply. **(06)**

(b) Explain what do you understand by the steady-state stability? What is the main assumption? **(05)**

Que-6

(a) Explain Fundamental Torque Equations and Derive Loads with Translational Motion. **(04)**

(b) What is meant by multi-quadrant operation? Explain using suitable diagrams. **(04)**

(c) What is the basic difference between true synchronous mode and self control mode for variable frequency control of synchronous motor? **(04)**

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