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MEPS-302(B)

M.E./M.Tech., III Semester

Examination, December 2017

Advanced Electrical Drives

(Elective - II)

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions out of eight.

ii) All questions carry equal marks.

1. a) What is an electrical drives? Explain essential part of electrical drives with block diagram. What are the factors for selection for electrical drives for given application?

   b) How to determine the motor rating for drives? The temperature rise of a motor when operating for 25minutes on full load is 25° and becomes 40° when the motor operates for another 25minutes on the same load. Determine heating time constant and the steady state temperature rise of the motor.

2. a) What do you understand by steady state stability of a drive? Obtain the equilibrium point and determine the steady state stability when motor torque and load torque are given as;

   $T = 1 - 2\omega_m$ and $T_1 = -3\sqrt{\omega_m}$

   b) Explain in details different method of braking in DC motor drives.

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3. a) With neat diagram describe working of 3-phase fully-controlled rectifier fed dc motor drive.

   b) A 200V, 875, 150A separately excited dc motor has an armature resistance of 0.06Ω. It is fed from a single phase fully controlled rectifier with an AC voltage source of 220V, 50Hz. Assuming continuous conduction, calculate:

      i) Firing angle at rated motor torque and 750rpm

      ii) Firing angle at rated torque and --500rpm

      iii) Motor speed for alph=160° at rated torque

4. a) Explain the operation of voltage source inverter fed induction motor drive under dynamic and regenerative braking condition.

   b) List different speed control method of an induction motor. Explain in detail the speed control of induction motor by stator voltage/Hertz control method.

5. a) A 440V, Three-phase 50Hz, 6-pole, 945rpm Delta connected induction motor has following parameters referred to the stator,

   $R_S = 2.0\Omega; R_r' = 2.0\Omega; X_S = 0.5\Omega; X_r' = 1\Omega$

   When driving a fan load with rated voltage it runs at rated speed. the motor speed is controlled by stator voltage control. Determine:

   i) Motor Terminal voltage, current and torque at 800rpm

   ii) Motor speed, current and torque varies linearly with speed

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b) Explain in detail with suitable sketch the close loop speed control of load commuted thyristor inverter fed synchronous motor drive.

6. a) In a variable frequency control of synchronous motor why voltage by frequency ratio is maintained constant up to base speed and voltage constant above the base speed.

b) What are relative merits and demerits of single phase and three induction motor? List different types of single phase induction motor with their respective applications?

7. a) Discuss 25kV AC traction drive employing transformer with tap changer. What are its advantages and disadvantages?

b) Explain in detail how the variable voltage operation of an induction motor provides energy saving specially during light load. What are the factors which influenced the amount of energy saved?

8. Write short notes on:

a) BLDC motor drive

b) Stepper motor drive

c) Switched Reluctance motor drive

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