Code No: 156CJ

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, February/March - 2022
POWER SEMICONDUCTOR DRIVES
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

1.a) Explain the operation of single phase fully-controlled converter connected to DC separately excited motor.
b) A 230 V, 1000 rpm, 10 A separately excited DC motor is fed from a single phase full converter with AC source voltage of 200 V, 50 Hz, $R_a = 5\ \Omega$. The armature current is continuous. Calculate the firing angle for rated motor torque at 750 rpm. [7+8]

2.a) Explain the operation of three phase fully-controlled converter connected to DC series motor.
b) A 440 V, 1000 rpm, 15 A separately excited DC motor has armature resistance and inductance of 1 Ω and 10 mH. The motor is controlled by a three phase full converter fed with source voltage 230 V, 50 Hz. Calculate the developed torque for $\alpha = 30^0$ and speed 800 rpm. [7+8]

3.a) Explain the differences between plugging, dynamic breaking and regenerative breaking.
b) A 200 V, 50 A DC series motor having combined resistance of 0.4 Ω is controlled in regenerative braking with supply of 220 V. The motor constant is 0.04 V-s/A-rad for a duty ratio of 50%. Determine the power returned to supply. [7+8]

4.a) Discuss the operation of chopper fed four quadrant separately excited DC motor.
b) Explain the four quadrant operation of DC motors by three phase dual converters. [7+8]

5.a) Explain the control of induction motor using AC voltage controllers.
b) A 440 V, 3 phase 50 Hz, 6-pole cage induction motor has the following equivalent circuit parameters: $R_s = 0.2\ \Omega$, $X_s = 0.5\ \Omega$, $R_r = 0.3\ \Omega$, $X_r = 0.5\ \Omega$ and $X_m = 20\ \Omega$, all quantities referred to stator side. The motor is operating on full load slip of 0.04. If the two stator terminals are suddenly interchanged, calculate the primary current and the braking torque immediately after application of plugging. [7+8]

6.a) Explain the variable frequency control of induction motors using cyclo converter.
b) A star connected squirrel cage induction motor has the following ratings and parameters: 440 V, 50 Hz, 6-pole, 1600 rpm, $R_1 = 1\ \Omega$, $X_1 = X_2' = 4\ \Omega$, $R_2' = 3\ \Omega$. The motor is controlled by a voltage source inverter at constant V/f ratio. The inverter allows a frequency of 60 Hz. Calculate the starting torque and current. [7+8]

7.a) Explain the static rotor resistance control of induction motors in detail.
b) Explain in detail about the working of static krammer drive. [7+8]

8.a) Explain in detail about the self-control of synchronous motors.
b) Explain the variable frequency control of synchronous motors using cyclo converter. [7+8]

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