

R16

Code No: 137FW

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, October/November - 2020

POWER SEMICONDUCTOR DRIVES

(Electrical and Electronics Engineering)

Time: 2 hours

Max. Marks: 75

Answer any Five Questions

All Questions Carry Equal Marks

1. A 230V, 650 rpm, 100A separately excited d.c. motor has armature circuit resistance and inductance of 0.08Ω and 0.1 H and assume continuous conduction. Motor is controlled by a single phase fully controlled rectifier with a source voltage of 230V, 50Hz. Determine speeds for a) $\alpha = 60^\circ$ and torque = 1000 N-m b) $\alpha = 120^\circ$ and torque = 1000 N-m. [15]
2. Discuss the operation of three phase fully controlled converter fed separately excited dc motor for continuous current operation and draw the output voltage and current waveforms. [15]
3. Discuss the Four-quadrant operation of an electrical drive with suitable application. [15]
- 4.a) Explain with neat circuit diagram the basic principle of operation of a class A type of chopper. The chopper is connected to RLE load.
b) A 230 V, 500 rpm, 90 A separately excited dc motor having an armature resistance and inductance of 0.115Ω and 11 mH respectively, is controlled by a class C two quadrant chopper operating with a source voltage of 230 V and a frequency of 400 Hz. Calculate the motor speed for a motoring operation at $\delta = 0.5$ and half of rated torque. [8+7]
- 5.a) Draw and explain the slip-torque characteristics of 3-phase induction motor fed from VSI with variable frequency operation keeping v/f ratio constant.
b) A 440V, 3 phase, 50Hz 6 pole 945 RPM delta connected Induction motor has the following parameters referred to the stator. $R_s = 2.0\Omega$, $R_r = 2.0\Omega$, $X_s = 3\Omega$, $X_r = 4\Omega$. When driving a fan load at rated voltage, it runs at rated speed. The motor speed is controlled by stator voltage control. Determine motor terminal voltage, current and torque at 600 RPM. [8+7]
6. Explain the speed control scheme for three phase induction motor using PWM inverter. [15]
7. Draw the speed torque characteristics of a rotor resistance controlled induction motor and explain the effect of rotor resistance variation. [15]
- 8.a) Explain the operation of self-controlled synchronous motor by VSI in detail.
b) Explain operation of load commutated CSI fed synchronous motor. [7+8]

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