

Code: 9A02601

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December 2015

POWER SEMICONDUCTOR DRIVES

(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain the concept of constant torque control and constant power control.
(b) A 220 V, 1200 rpm, 100 A separately excited DC motor is fed from 1- Φ , fully controlled converter with an ac source 230 V, 50 HZ supply. The thyristor is triggered continuously by a DC signal. The resistance of armature circuit is 0.06 Ω . Find the firing angle of the converter for rated motor torque and 700 rpm.
- 2 Explain the Speed - Torque characteristics of a DC series motor connected to a three-phase fully controlled converter.
- 3 (a) What is 4-quadrant operation and explain with converters.
(b) Discuss in detail, counter current and dynamic braking operations of dc shunt motor.
- 4 (a) Distinguish between class A and class B choppers with suitable examples of speed control of motors.
(b) A dc supply of 220 V supplied power to separately excited dc motor via a class A thyristors chopper. The motor has an armature circuit resistance of 0.03 Ω and inductance of 3mH. The chopper is fully on at the rated motor speed 1200 rpm when the armature current is 50 A. If the speed is to be reduced to 1000 rpm with the load torque constant, calculate the necessary duty cycle.
- 5 (a) Explain the Torque-speed characteristics of Induction Motor with the help of equivalent circuit of induction motor.
(b) How speed control is achieved with stator voltage control?
- 6 Compare the Cylo-converter fed Induction motor and VSI fed induction motor drives.
- 7 Why the slip- power recovery scheme is suitable mainly for drives with a low speed range? Derive the necessary mathematical expressions.
- 8 A 6 MW, 3-Phase, 11 kV, Star connected, 6-pole, 50 Hz, 0.9(leading) power factor synchronous motor has $X_s = 9$ ohms and $R_s = 0$ ohms. Rated field current is 50 A. Machine is controlled by variable frequency control at constant V/f ratio up to the base speed and at constant V above base speed. Determine:
(a) Armature current and power factor for regenerative braking power output of 4.2 MW at 750 rpm and rated field current.
(b) Torque and field current for regenerative braking operation at rated armature current, 1500 rpm and unity power factor.
