H.T No: | | | | | | | | | | | **R18** **Course Code: B30311**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

M.Tech II Semester Supplementary Examinations March/April-2023

Course Name: SOLID STATE AC DRIVES

(Power Electronics)

Date: 21.03.2023 FN **Time: 3 hours** **Max.Marks: 70**

(Note: Assume suitable data if necessary)

PART-A

Answer all FIVE questions (Compulsory)

Each question carries FOUR marks. **5x4=20M**

1. When operating in regenerative braking, the induction motor slip should not be allowed to exceed the breakdown slip, why? 4M
2. Explain, how will the PWM voltage, as compared to six-step voltages, affect the torque pulsation both in magnitude and frequency? 4M
3. Write short note on slip power recovery drives. 4M
4. Develop a procedure to synthesize the torque component current controller for an indirect vector-controlled induction motor drive. 4M
5. Draw the equivalent circuit of wound rotor synchronous motor and obtain its performance equations 4M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

6. A). A 500 V, 3-phase, 50 Hz, 8-pole, star connected induction motor has the following parameters of its equivalent circuit. 10M

$R_s = 0.13\ \Omega$, $X_s = 0.6\ \Omega$, $R_r' = 0.32\ \Omega$, $X_r' = 1.48\ \Omega$, $Rm = 250\ \Omega$, $X_m = 20\ \Omega$.

The full-load slip is 5%. The effective stator to rotor turns ratio per phase is 1/1.57. The machine is to be braked from full-load speed by changing its stator connections and inserting an external rotor circuit resistance, which in primary terms is 1.5 Ω per phase (referred to the stator). Determine the initial braking torque, when the stator is disconnected from the AC supply and DC is fed into two of its terminal. Determine also the required DC excitation and the braking torque for counter current braking. Neglect mechanical losses and us the approximate equivalent circuit.

OR

6. B). Identify the different braking methods of induction motor and explain them with necessary diagrams. 10M

7. A). i) Compare voltage- and current-source inverters in terms of their reliability, control complexity and harmonics for induction motor control. 4M

ii) Explain, how the induction motor speed controlled using AC voltage controller. 6M

OR

7. B). Explain the operation of six-step voltage inverter to control the speed of induction motor with neat waveforms. 10M

8. A). Explain modes of operation of Static Scherbius drive with neat sketches. 10M

OR

8. B). Explain the operation of modified Kramer drives with neat diagrams. 10M

(P.T.O..)

9. A). Develop a procedure to synthesize the torque and flux-component current controllers for a direct vector-controlled induction motor drive. What are the salient difference between indirect and direct current controllers? 10M

OR

9. B). Explain the operation of direct torque control strategy for induction motor with neat diagrams. 10M

10. A). Explain the forward motoring and braking operation of open loop *v/f* control PM synchronous motor with relevant circuit and phasor diagrams. 10M

OR

10. B). Derive the steady state performance equations for the unity power factor control strategy of a synchronous motor drive. 10M

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H.T No: | | | | | | | | | | | **R18** **Course Code: B30312**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

M.Tech II Semester Supplementary Examinations March/April-2023

Course Name: SOLID STATE DC DRIVES

(Power Electronics)

Date: 24.03.2023 FN **Time: 3 hours** **Max.Marks: 70**

(Note: Assume suitable data if necessary)

PART-A

Answer all FIVE questions (Compulsory)

Each question carries FOUR marks. **5x4=20M**

1. Explain the various components of load torque. 4M
2. What is the effect of freewheeling diode on converter performance? 4M
3. Explain the operation of DC separately excited motor fed by class-A chopper. 4M
4. Derive the transfer function of a converter fed separately excited D.C motor. 4M
5. Illustrate the program flow chart for constant horse power operation of D.C drive. 4M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

6. A). i) Explain the ward leonard method of speed control of DC drive. 5M

ii) A 230 V, 500 rpm, 100 A separately excited dc motor has an armature resistance of 0.1 Ω. The motor is driving, under rated conditions, a load whose torque is constant and independent of speed. If the motor is now coupled to an overhauling load with a torque of 800 N-m. Determine the speed at which the motor can hold the load by regenerative braking. Neglect the motor's rotational losses. 5M

OR

6. B). Explain in detail Multi-Quadrant operation of DC drives. 10M

7. A). A 220 V, 1500 rpm, 11.6 A separately excited motor is controlled by a single phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz. Enough filter inductance is added to ensure continuous conduction for any torque greater than 25 percent of rated torque, $R_a = 2\Omega$. 10M

i). What should be the value of the firing angle to get the rated torque at 1000 rpm?

ii). Calculate the firing angle for the rated braking torque and -1500 rpm.

iii). Calculate the motor speed at the rated torque and $\alpha = 160^\circ$ for the regenerative braking in the second quadrant.

OR

7. B). Analyze the performance characteristics of Drive employing dual converter. 10M

(P.T.O..)

8. A). A 230 V, 500 rpm, 90 A separately excited de motor has the armature resistance and inductance of 0.115 Ω and 11 mH respectively. The motor is controlled by a class C two-quadrant chopper operating with a source voltage of 230 V and a frequency of 400 Hz. 10M

i). Calculate the motor speed for a motoring operation at $\delta = 0.5$ and half of rated torque.

ii). What will be the motor speed when regenerating at $\delta = 0.5$ and rated torque?

OR

8. B). Interpret the Two Quadrant operation of DC drive for forward motoring and reverse braking control employing Class-D chopper. 10M

9. A). Explain in detail about armature voltage control and field weakening control of drives in closed loop configurations. 10M

OR

9. B). Outline the closed loop speed control scheme of DC separately excited drive employing PID controller. 10M

10. A). Develop micro-computer based control scheme for speed control of DC drive. 10M

OR

10. B). Outline the operation of speed detection and current sensing circuits with its basic structure. 10M

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H.T No: | | | | | | | | | | | R18 | Course Code: B30314

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
M.Tech II Semester Supplementary Examinations March/April-2023
Course Name: FLEXIBLE AC TRANSMISSION SYSTEMS
(Power Electronics)

Date: 28.03.2023 FN **Time: 3 hours** **Max.Marks: 70**

(Note: Assume suitable data if necessary)

PART-A

Answer all FIVE questions (Compulsory)

Each question carries FOUR marks. **5x4=20M**

1. Distinguish between transient stability and steady state stability in power flow systems. 4M
2. What are the effects of harmonics in a converter. 4M
3. Write Objectives of Shunt Compensation. 4M
4. Write the basic principle difference between series and shunt compensation. 4M
5. Name the different modes of TCSC. 4M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

6. A). Explain the dynamic stability considerations of an interconnected transmission system. 10M

OR

6. B). i) List out various FACTS controllers with their control attributes. 5M
ii) Write down the importance of controllable parameters. 5M

7. A). Describe the voltage-sourced converter concept with necessary schematics. 10M

OR

7. B). Enumerate single phase full-wave bridge converter operation. 10M

8. A). Obtain transfer function of static VAR compensator and mention its compensation effect on stability. 10M

OR

8. B). Explain the concept of end of line voltage support to prevent voltage stability in shunt compensation. 10M

9. A). Write a comparison between STATCOM and SVC in the following: i) V-I characteristics and ii) transient stability. 10M

OR

9. B). Discuss the operation of STATCOM with a neat block diagram and characteristics. 10M

10. A). Enumerate the basic operating control schemes of TSSC and TCSC. 10M

OR

10. B). Discuss the effect of series capacitive compensation and transient stability in transmission lines. 10M

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H.T No: | | | | | | | | | | | **R18** **Course Code: B30316**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

M.Tech II Semester Supplementary Examinations March/April-2023

Course Name: POWER QUALITY

(Power Electronics)

Date: 01.04.2023 FN **Time: 3 hours** **Max.Marks: 70**

(Note: Assume suitable data if necessary)

PART-A

Answer all FIVE questions (Compulsory)

Each question carries FOUR marks. **5x4=20M**

1. Define Power quality. Explain the reasons for increased concern in power quality. 4M
2. What is the importance of the concept pf in power quality? 4M
3. Explain about importance of voltage regulation in load compensation 4M
4. Explain about ideal three phase shunt compensator structure. 4M
5. Explain about Rectifier supported DVR. 4M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

6. A). What are the major power quality issues? Explain in detail. 10M

OR

6. B). Write a short note on: 10M
i) Notching ii) Voltage imbalance iii) Voltage fluctuations.

7. A). Discuss about three phase, three wire and four wire and their role in power quality. 10M

OR

7. B). Describe about non sinusoidal voltage source supplying non linear load current with suitable example. 10M

8. A). What is the need for protection against over voltages? What are the basic principles of over voltages protection of load equipment? 10M

OR

8. B). Explain briefly about the necessity of harmonic reduction and voltage reduction in power system. 10M

9. A). Explain how reference current is generated using instantaneous PQ theory. 10M

OR

9. B). Explain about realization and control of DSTATCOM. 10M

10. A). With a neat sketch explain about DC capacitor DVR. 10M

OR

10. B). Explain about UPQC necessity in series compensation of power distribution system. 10M

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