KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY

NAMAKKAL- TRICHY MAIN ROAD, THOTTIAM

DEPARTMENT OF MECHANICAL ENGINEERING

EE8353 – ELECTRICAL DRIVES AND CONTROLS

III – SEMESTER

UNITWISE QUESTION BANK

UNIT I INTRODUCTION

PART-A (2 MARKS)

1. Define Drives
2. Define Electric Drives.
3. What are the basic elements of Electric Drives?
4. Write the classification of Electric Drives.
5. Draw the block diagram of Electric Drive.
6. What is meant by Group drive? Give an example.
7. What is meant by Individual drive? Give an example.
8. What is meant by Multi-motor drive? Give an example.
9. What are the advantages and disadvantages of Individual drive system?
10. What are the advantages and disadvantages of Group drive system?
11. What are the advantages of electric drive over mechanical drive?
12. Mention the drawbacks of electric drives.
13. What are the factors influencing the choice of electric drives?
14. Mention the functions of Power modulators.
15. Compare Individual, Group and Multi-motor drives.
16. What are the motors used in Electric drives?
17. Mention the necessity of power rating?
18. Write down the dissipation equation due to convection process.
19. Draw the heating and cooling curve for a particular electric drive.
20. What are the classes of duty for an electric motor?
21. What is meant by continuous duty?
22. What is meant by continuous duty variable load?
23. What happens if the motor is selected at highest load handling capacity at continuous duty variable?
24. What is meant by time intermittent duty?
25. What is meant by periodic intermittent duty?
26. What is duty factor?
27. Give the assumptions for heating and cooling calculation.
28. What is heating curve?
29. Define Heating time constant.
30. What is cooling curve?
31. Compare A.C drives and D.C drives.
32. What is meant by short time rating of motor?
33. What are the factors that affect the power rating and size of electric drives?

PART-B(16 MARKS)

1. Explain the factors governing the selection of motors.
2. Discuss in detail the determination of power rating of motors.
3. (i) Explain the different types of loading of drives.
   (ii) Explain the choice of selection of the motor for different loads.
4. (i) Describe the simplifications based on which the heating and cooling calculations of an electric motor are made.
   (ii) Establish the heating time constant and the heating curves.
5. (i) Compare the D.C and A.C drives.
   (ii)Write a brief note on classes of duty for an electric motor.
6. Draw the typical temperature rise-time curve and derive the equation for temperature rise in an electric drive.

7. Explain the loading of an electric motor and its duty cycle with a simple diagram.
8. Explain in detail about the various types of electric drives.
9. (a)AT full load of a 10 H.P the temperature rise of a motor is 25°c after one hour and 40°c after two hours. Find (1) the final temperature rise on full load (2) heating time constant of motor (3) half hour rating if iron losses which remain constant are 80% of Copper losses at full load.
   (b) The 10 minutes rating of a motor used in domestic mixer is 200 watts. The heating time constant is 40 minutes and the maximum efficiency occurs at full load (continuous). determine the continuous rating.
10.(a) The temperature rise of a motor when operating for 25 min on full load is 25°c and Becomes 40°c when the motor operates for another 25 min on the same load. Determine heating time constant and steady state temperature rise.
   (b). The temperature rise of motor after operating for 30 minutes on full load is 20°c and after another 30 minutes 30°c on the same load. Find the final temperature rise and time constant.

UNIT II - MOTOR CHARACTERISTICS

PART-A (2 MARKS)

1. Why motor characteristics are important?
2. Why DC series motor should never be started on no-load?
3. Why a fly-wheel setup is used in DC series motor?
4. Why differential compound motors are not used in practical?
5. What is the main reason of fitting fly-wheel along with the motor?
6. Draw the mechanical (or) speed –torque characteristics of all type of DC Motors.
7. State the condition at which the starting toque developed in a slip-ring induction motor is maximum.
8. State the different modes of operation of three phase induction machines.
9. What is mechanical characteristics of a motor?
10. Give the application where DC Shunt, DC Series and DC Compound motors are used.
11. Draw the torque-slip characteristics of a three phase squirrel cage induction motor.
12. What is meant by braking?
13. Mention the Classifications of Braking.
14. What are the advantages and disadvantages of Electrical Braking?
15. Explain the plugging method of braking.
16. Why regenerative braking is not possible ion DC Series motor without modification?
17. Give the types of braking used for DC Motors.
18. What is meant by Regenerative braking in DC Motor?
19. Mention the demerits of mechanical braking
20. Give the advantage of dynamic braking.
21. What is meant by rheostat (or) dynamic braking?
22. What is meant by Plugging in DC Motor?
23. Draw the speed-torque characteristics of various types of loads.
24. What are the conditions for the stable operations of the motors?
25. List the electrical braking for DC Compound Motor.

PART-B(16 MARKS)

1. (i). List out the advantages and disadvantages of electrical braking over mechanical braking.
   (ii).Discuss any one method of electrical braking of DC Machines.
2. Explain the Speed-Torque characteristics of three phase induction motor with neat diagrams.
3. Explain about the speed-torque characteristics of a DC Shunt Motor with suitable graph and equations.
4. Explain about the quadrantal diagram of speed-torque characteristics for a motor driving hoist load.
5. Explain how an induction motor is brought to stop by (i) Plugging and (ii).dynamic braking.
6. Explain the various methods of braking of induction motors.
7. Draw and explain various load characteristics of DC Shunt Motor.
8. Explain Rheostat braking in DC Series Motor and Plugging in DC Shunt Motor.
9. Explain various methods of braking of DC Shunt Motors with neat diagrams.
10. Explain various methods of braking of DC Series Motors with neat diagrams.
11. (i). Explain the speed – torque curve of single phase induction motors in detail.
    (ii). Explain the method of regenerative braking employed in DC Motors.

12. Explain about the speed-torque characteristics of a DC Compound Motor with suitable graph and equations.
13. A 400 V, 750 r.p.m., 70 A dc shunt motor has an armature of 0.3 ohm. When running under rated conditions, the motor is to be braked by plugging with armature current limited to 90A. what external resistance should be connected in series with the armature? Calculate the initial braking torque and its value when the speed has fallen to 300 rpm. Neglect saturation.

UNIT III-STARTING METHODS

PART-A (2 MARKS)

1. What are the functions of starters?
2. What are the factors influencing the selection of starters?
3. Why starter is necessary for starting a DC Motor?
4. What are the starters used for starting DC Motors?
5. Why is starting current high in a DC Motor?
6. What are the protective devices used in DC Motor Starters?
7. How does the four point starter differ from three point starter?
8. Explain the function of NVR coil in DC Motor Starters?
9. Explain the function of OLR coil in DC Motor Starters?
10. What are the different methods of starting three phase induction motors?
11. How many terminals are provided on the terminal box of a squirrel cage induction Motor to be started by a star-delta starter?
12. Mention the reasons for most of the three phase induction motors provided with delta connected stator winding?
13. Write the applications of three phase induction motors?
14. Mention the merits of DOL starter.
15. Mention the demerits of DOL starter.
16. Why stator resistance starter is rarely used?
17. What are the effects of increasing rotor resistance on starting current and start torque?
18. How reduced voltage starting of induction motor is achieved?
19. How automatic starters are working in DC Motors?
20. How we start the wound-rotor (slip-ring) motors?
21. Why single phase induction motor is not self-starting?

PART-B (16 MARKS)

1. Draw a neat schematic diagram of a three point starter and explain its working.
2. Draw a neat schematic diagram of a four point starter and explain its working.
3. Explain with neat circuit diagram, the star-delta starter method of starting squirrel cage induction motor.
4. Explain the typical control circuits for DC Series and Shunt motors.
5. Explain the different starting methods of three phase squirrel cage induction motors with neat sketches.
6. Explain different methods of starting of DC Motors.
7. Explain with neat diagram the starting of three phase slip ring induction motor.
8. Draw and explain the push-button operated direct-on line starter for three phase induction motor.
9. Draw and explain the manual auto-transformer starter for three phase induction motor.
10. (a). A starter required for a 220V shunt motor. The maximum allowable current is 55 A and the minimum current is about 35 A .Find the number of starter resistance required and the resistance of each section. The armature resistance of the motor is 0.4 ohm.

(b). A three phase delta connected cage type induction motor when connected directly to 400 V, 50 HZ supply takes a starting current of 100 A in each stator phase. Calculate (i).line current on direct on line starting. (ii).line and phase starting currents for star-delta starting. (iii).line and phase starting currents for a 70% tapping on autotransformer starting.

UNIT IV - CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C DRIVES

PART-A (2 MARKS)

1. Enumerate the factors on which the speed of a DC Motor depends.
2. By what methods can the speed of a DC Shunt Motor be controlled?
3. Why the field control is considered superior to armature resistance control for DC Shunt Motors?

4. What is the effect of inserting resistance in the field circuit of a DC Shunt Motor on its speed and torque?
5. What is meant by speed control?
6. Mention the different methods of speed control employed for DC Series Motor.
7. What is meant by armature control?
8. What will be the effect of change in supply voltage on the speed of DC Shunt Motor?
9. What are the advantages and disadvantages of armature resistance control of DC Shunt Motor?
10. What are the advantages and disadvantages of Field control (or) Flux control method?
11. What is meant by flux control (or) field control method?
12. In which type of control the field current and armature current kept constant?
13. How we select the shunt and series motor based on the torque and speed in particular application?
14. Write down the applications of Ward-Leonard system of speed control.
15. What are the advantages and disadvantages of Ward-Leonard method of speed control?
16. Write down disadvantages of armature diverted method of speed control of DC Series Motor.
17. What is meant by solid state speed control?
18. What are the advantages and disadvantage of solid state drive methods?
19. What is meant by DC Chopper?
20. What is meant by duty cycle?
21. What are the different types of Chopper?
22. What is the function of freewheeling diode?
23. Write the output equation for single phase half and full converters.
24. What are the arrangements are available using Power semi-conducting materials?
25. What are the two main methods for speed control of DC Shunt Motor?
26. What are the advantages of thyristor control on speed control of DC Motor?
27. Why Chopper based D.C drives give better performance than rectifier controlled drives?
28. Name the solid state controllers used for the speed control of D.C Shunt motor and Series Motor.
29. What is free-wheeling?

PART-B (16 MARKS)

1.Explain with neat sketch the chopper control method of speed control of DC Motors.
2. Explain with neat sketches about the DC Shunt Motor speed control by using single phase fully controlled bridge converter.
3. Discuss the Ward-Leonard speed control system with a neat circuit diagram. Also mention its advantages and disadvantages.
4. Explain how the speed of a DC Shunt Motor can be varied both above and below the speed at which it runs with full field current.
5. (i) Explain with neat sketch the operation of chopper fed DC Series Motor drive. Also, derive the expression for average motor current.
(ii) Explain Time ratio control and Current limit control.
6. Explain the speed control schemes of DC Series Motor.
7. Explain the different methods of speed control employed in DC Shunt Motor.
8. Explain the control of DC drives using rectifiers and choppers.
9. Explain the single phase half wave converter drive speed control for DC drive with waveforms.
10. Explain in detail single phase semi-converter speed control for DC drive for separately excited motor.
11.(a).Speed of 200V SERIES MOTOR IS 800 RPM and takes 60 A. If 1/3 of the field turns are cut out, find out the speed, assuming torque to remain constant. Armature resistance is 0.2ohms and field resistance is 0.21 ohms.
(b).A 200 V, 10.5 A,2000rpm.shunt motor has the armature and field resistance of 0.50Ω and 400Ω respectively. Its drives a load whose torque is constant at rated motor torque. Calculate the motor speed ifthe source voltage drops to 175 V.

UNIT V -CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C DRIVES

PART-A (2 MARKS)

1. List the different methods of speed control of three phase induction motor.
2. Write short notes about cascaded method of speed control?

3. Define Slip.
4. What is slip-power recovery system?
5. What are the advantages of Slip-power recovery system?
6. What is meant by Voltage control in induction motor? and where it is applicable?
7. What is meant by Voltage / Frequency control?
8. What are the main features of V/f control?
9. What is meant by Stator frequency control?
10. What is meant by AC Voltage controller?
11. Mention the advantages and disadvantages of Stator voltage control.
12. What are the possible methods of speed control available by using inverter?
13. Why we go for PWM inverter control?
14. Write the classifications of PWM techniques.
15. What is meant by Cyclo converter?
16. Write the types of cyclo converter.
17. Write the applications of Cyclo converter.
18. Write down the limitation of cyclo converter method of speed control.
19. Compare the Static Kramer and Scherbius System.
20. What are the advantages and disadvantages of Static Scherbius scheme of speed control?
21. Write the speed equation of an induction motor.
22. What is VVVF control?

PART-B(16 MARKS)

1. Draw the power circuit arrangement of three phase variable frequency inverter for the speed control of three phase induction motor and explain its working.
2. Explain the V/f control method of AC drive with neat sketches.
3. Discuss the speed control of AC motors by using three phase AC Voltage regulators.
4. Explain the speed control schemes of phase wound induction motors.
5. Explain the concatenation operation of three phase induction motors. Hence derive the speed experienced forthe cascaded set.
6. Explain in detail about Slip power recovery scheme.
7. Explain the different methods of speed control used in three phase induction motors.
8. Explain the working of following methods with neat circuit diagram. i) Kramer system ii) Scherbius system
9. Explain in detail rotor resistance method of speed control of a slip ring induction motor.
10. (i) Explain the operation of Pole changing method of speed control.
(ii) Explain the pole amplitude modulation method.
11. Explain the static Kramer method and static scherbius method of speed control of three phase induction motor.
12. Explain in detail about the various methods of solid state speed control techniques by using inverters.
13. Explain the solid state stator voltage control technique for the speed control of three phase induction motor.
14. Explain the various methods of speed control of a three phase induction motor when fed through semiconductor devices.
15.(a).A 3 phase.4 pole, 415 V,50 HZ induction motor has a star connected stator. The rotor impedance at standstill is 0.1+j0.9Ω.The stator to rotor turns ratio is 1.75.calculate the external resistance per phase required in the rotor to limit starting rotor current to 60 A, using rotor resistance starter.

(b).A 50 HZ induction motor uses a pole amplitude modulation method to control the speed. The stator has 16 poles while the pole modulating function has 4 poles. At what speeds motor can run?