INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	**:**	**Static Drives**
Course Code	**:**	**A60225**
Class	**:**	**III-B.TECH II SEM**
Branch	**:**	**EEE**
Year	**:**	**2017 – 2018**
Course Coordinator	**:**	**Mr. P. SHIVAKUMAR, Assistant Professor**
Course Faculty	**:**	**Mr. P. SHIVAKUMAR, Assistant Professor**

OBJECTIVE:

This course is an extension of power electronics applications to AC and Dc drives. Control of DC Motor drives with single phase and three phase converters and choppers are given in detail. The control of AC motor drives with variable frequency converters and variable voltage are presented.

ASSIGNMENT - I			
UNIT - I			
1	Derive an expression relating speed and torque of a single phase full converter fed separately excited DC motor drive operating in the continuous current mode.	Understand	1
2	Describe the operation of single phase fully controlled rectifier control of DC series motor and obtain the expression for motor speed for continuous mode of operation.	Understand	1
3	Describe the operation of single phase semi controlled rectifier control of DC series motor and obtain the expression for motor speed for continuous mode of operation.	Understand	1
4	Describe the operation of single phase Semi controlled rectifier control of DC separately excited motor and obtain the expression for motor speed for continuous mode of operation.	Understand	1
5	Explain the use of freewheeling diode in the converter fed DC drives. Take an example of 1-phase fully controlled converter fed for explanation. How it is going to affect the machine performance.	Understand	1
6	What are the advantages of three phase drives over single phase drives?	Understand	1, 2
7	Explain the motoring and braking operation of three phase fully controlled rectifier control of dc separately excited motor with aid of diagrams and waveforms. Also obtain the expression for motor terminal voltage speed.	Understand	2
8	Explain the operation of three phase full controlled rectifier fed dc series motor drives with waveforms and characteristics.	Understand	2

9	Explain the operation of three phase half controlled rectifier fed dc series motor drives with waveforms and characteristics.	Understand	2
10	Explain the operation of three phase half controlled rectifier fed dc separately excited DC motor drives with waveforms and characteristics	Understand	2
UNIT - II			
11	A 220V, 970rpm, 100A DC separately excited motor as an armature resistance of 0.05ohm. It is braked by plugging from an initial speed of 1000rpm. Calculate Calculate the resistance to be placed in armature circuit to limit breaking current to twice the full load value. Breaking torque and Torque when the speed has fallen to zero.	Understand	5
12	A 200V, 100A DC series motor runs at 1000rpm is operated under dynamic breaking at twice the rated torque and 800rpm. The resistance of armature and field winding is 0.1 ohm. Calculate the value of breaking current and resistance.	Understand	5
13	A 200V, 1500rpm, 50A separately excited motor with armature resistance of 0.5 ohm is fed from a circulating current dual converter with AC source voltage 165V. Determine converter firing angle for the following operating points i) Motoring operation at rated motor torque and 1000rpm. ii) Braking Operation at rated motor torque and 1000rpm	Understand	5
14	A220V DC series motor runs at 1200 rpm and takes an armature current of 100 A when driving a load with a constant torque. Resistances of the armature and field windings are 0.05 Ω each. DC series motor is operated under dynamic braking at twice the rated torque and 1000 rpm. Calculate the value of braking current and resistor. Assume linear magnetic circuit.	Understand	5
15	A 220V, 200A, 800 rpm dc separately excited motor has an armature resistance of 0.05Ω. The motor armature is fed from a variable voltage source with an internal resistance of 0.03 Ω. Calculate internal voltage of the variable voltage source when the motor is operating in regenerative braking at 80% of the rated motor torque and 600rpm.	Understand	4
16	A 220V, 750 rpm, 200A separately excited motor has an armature resistance of 0.05 Ω. Armature is fed from a three phase non-circulating current dual converter consisting of fully controlled rectifiers A and B. Rectifier A provides motoring operation in the forward direction and rectifier Vin reverse direction. Line voltage of ac source is 400V. Calculate firing angles of rectifiers for the following assuming continuous conduction. Motoring operation at rated torque and 600rpm Regenerative braking operation at rated torque and 600 rpm.	Understand	6
UNIT - III			
17	Draw the diagram of two quadrant type B chopper Drives	Remember	8
18	Draw the diagram of four quadrant chopper drives	understand	9
19	Draw the diagram of two quadrant chopper drives	understand	8
20	Deduce the mathematical expression for minimum and maximum currents for a class A chopper operated DC motor with back emf.	Understand	8
ASSIGNMENT - II			
UNIT - III			
1	Discuss with the suitable diagrams I quadrant and II quadrant choppers.	Understand	8

2	Distinguish between class A and class B choppers with suitable examples of speed control of motors	Understand	8
3	List the advantages offered by DC chopper drives over line commutated converter controlled DC drives.	Understand	8
4	Explain the operation of the two quadrant chopper fed DC drive system	Understand	9
5	Draw the diagram of regenerative chopper fed separately excited DC motor drive	Remember	9
UNIT - IV			
6	Why stator voltage control is an inefficient method of induction motor speed control.	Understand	10
7	Constant torque loads are not suitable for AC voltage controller fed induction motor drive. Why?	Understand	10
8	Using 3-phase solid state AC voltage controllers explain clearly how it is possible to achieve 4-quadrant operation of 3-phase induction motors.	Understand	10
9	Draw a closed loop block diagram for the above speed control technique. Mention the merits of the above method of speed control.	Remember	10
10	Explain the mechanical characteristics of a three phase induction motor with stator frequency control.	Understand	11
11	Explain in detail the speed control scheme for a three phase induction motor using PWM inverter.	Understand	11
12	Sketch the mechanical characteristics of a there phase induction motor with V/f method.	Understand	11
13	Draw the speed-torque characteristics of a rotor resistance controlled induction motor and explain the effect of rotor resistance variation	Understand	12
UNIT - V			
14	Draw the block diagram of a closed loop synchronous motor drive fed from VSI and explain	Remember	14
15	Describe the open-loop and closed loop methods of speed control of a synchronous motor using VSI	Understand	14
16	Discuss the VSI method of speed control of synchronous motor describe the operation of the converter with waveforms.	Remember	14
17	How is the output voltage of a VSI improved by PWM techniques? Explain how you will use this converter for speed control of a synchronous motor.	Remember	14
18	Describe self-controlled and a loop commutated inverter controlled synchronous motor drives in detail and compare them	Understand	13
19	Describe separate controlled mode and self-controlled mode of operation of a synchronous motor drive in detail and compare them	Understand	13
20	Explain how three phase synchronous motor fed by a three phase inverter can be making to behave like a simple dc motor. Hence is it proper to call them as a commutator less DC motor	Understand	14

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