SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : Power Semiconductor Drives (**20EE0225**) **Course & Branch**: B.Tech - EEE

Year & Sem: III-B.Tech & II-Sem **Regulation:** R20

UNIT –I
CONVERTER FED DC MOTORS

1		Draw and explain the operation of 1-Ø semi controlled converter fed by separately excited dc motor.	[L2][CO1][12M]
2		A 1-Ø,230V,50HZ supply feeds a separately excited dc motor through two 1-Øsemi converters, one for the field and the other for the armature. The firing angle for the semi converter in field circuit is zero, the field resistance is 200Ω and the armature resistance Ra is 0.3Ω. The load torque is 50 N-m at 900 rpm, the voltage constant is 0.8V/A-rad/s and the torque constant is 0.8N-m/A^2.assume that the armature and field currents are continuous and constant, and neglect the losses. Find the following (a) The field current (b) The firing angle and (c) The power factor of semi-converters in the armature circuit.	[L3][CO1][12M]
3		With neat diagram, explain 1-Ø fully controlled converter fed by separately excited DC motor in continuous conduction mode.	[L4][CO1][12M]
4		Sketch the appropriate voltage and current waveforms for 1-Ø semi controlled converter fed by dc series motor and explain operation.	[L3][CO1][12M]
5		The speed of a 20HP, 210V, 1000rpm series dc motor is controlled by a 1-Ø fully controlled converter. The combined field and armature circuit resistance is 0.25Ω , K_{af}=0.03N-m/ A^2 and K_{res}=0.075 V-S/rad. The supply voltage is 230V. Assuming continuous and ripple free motor current, determine the following for a firing angle α=30^0 and speed N=1000 rpm. i. The motor torque ii. The motor current iii. The supply power-factor.	[L3][CO1][12M]
6		For firing angle α=30°, draw voltage and current waveforms of 3-Ø semi converter fed by DC series motor and explain its operation.	[L5][CO1][12M]
7		A 100KW, 440V, 1000 rpm dc motor running at 800rpm and developing 75% rated torque is controlled by a 3-Ø, 6-pulse thyristor converter. If the back emf at rated speed is 410V, determine the triggering angle of the converter. It is fed with a 3-Ø, 415V, 50Hz ac supply.	[L3][CO1][12M]
8		Draw and explain operation of 3-Ø fully controlled converter fed by separately excited dc motor.	[L2][CO1][12M]

9		The speed of a 150HP, 650V, 1750 rpm separately excited DC motor is controlled by 3-ϕ full converter. The converter is operating from 3-ϕ, 460Volts, 50Hz Supply. The rated armature current of the motor is 170A.The motor parameters are R_a=0.099Ω, L_a=0.73mH, $K_{a\phi}$=0.33V/rpm. Determine, (a) The no load Speed at $\alpha=0^0$ and $\alpha=30^0$. Assuming no load, the armature current is 10% of rated current and is continuous. (b) Calculate the firing Angle at 1750rpm of rated motor current also computes the supply p.f. (c) The speed regulation.	[L3][CO1][12M]
10		Using RLE load, analyze the operation of three phase fully controlled converter with neat sketch.	[L4][CO1][12M]

UNIT –II

FOUR QUADRANT OPERATION OF DC DRIVES

1		Write short notes on a) Plugging b) Dynamic braking c) Regenerative braking	[L2] [CO2] [12M]
2		A non-circulating current dual converter is connected to a dc motor. Explain its control strategies for selecting its multi-quadrant operation converter with the help of power circuit diagrams.	[L5] [CO2] [12M]
3		A 220V, 970 rpm, 100A dc separately excited motor has an armature resistance of 0.05Ω. It is Braked by plugging from an initial speed of 1000rpm. Calculate a) Resistance to be placed in armature circuit to limit braking current to twice the full load value, b) Braking torque c) Torque when the speed has fallen to zero.	[L3] [CO2] [12M]
4	a	Compare Ideal and practical dual converter based on various aspects.	[L3] [CO2] [6M]
	b	Compare practical non circulating and circulating type dual converter.	[L3] [CO2] [6M]
5		A 220V, 750rpm, 200A separately excited motor has an armature resistance of 0.05 Ω. Armature is fed from a 3-phase non-circulating current mode dual converter, consists of fully controlled rectifiers A & B. Rectifier A provides motoring operation in the forward direction, rectifier B in reverse direction. Supply voltage of ac source is 400Volts. Calculate firing angle of rectifier for the motoring operation at rated torque and 600rpm, assuming continuous conduction. .	[L3] [CO2] [12M]
6	a	Draw and explain operation of current limit control	[L2] [CO2] [6M]

	b	Draw and explain operation of torque control by using closed loop control of DC Drives.	[L2] [CO2] [6M]
7		A 400V, 750 rpm, 70A, dc shunt motor has an armature resistance of 0.3Ω, when running under rated condition, the motor is to be braked by plugging with armature current limited to 90A. What external resistance should be connected in series with the motor? Calculate the initial braking torque and its value when the speed is increased to 300 rpm.	[L3] [CO2] [12M]
8		With a neat diagram, explain the four quadrant operation of a DC drive in all four quadrants. When fed by a three phase circulating current mode dual converter.	[L4][CO2] [12M]
9	a	A 230V, 870rpm, 100A separately excited DC motor has an armature resistance of 0.02Ω. It is coupled to an over hauling with a torque of 400N-m. Determine the speed at which motor can hold the Load by regenerative braking.	[L3] [CO2] [6M]
	b	Explain the operation of closed loop speed control of dc drive.	[L2] [CO2] [6M]
10		A 220V, 1000 rpm, 60A separately excited dc motor with an armature resistance of 0.6 Ω is fed from a circulating current dual converter with ac source voltage (line) of 165 volts. Determine converter firing angles for the following operating modes, i) Motoring operation at rated motor torque & 900 rpm. ii) Braking operation at rated motor torque & 900 rpm iii) Motoring operation at rated motor torque & -900 rpm iv) Braking operation at rated motor torque & -900 rpm.	[L3] [CO2] [12M]

UNIT –III
CHOPPER FED DC MOTORS

1		Explain the operation of first quadrant chopper fed by separately excited DC motor with necessary waveforms.	[L2] [CO3] [12M]
2		Describe how the operation of second quadrant can be obtained from chopper fed by separately excited DC motor.	[L2] [CO3] [12M]
3		A separately excited dc motor with armature resistance of 0.01Ω with dc supply 220V, 100A, 1000 rpm is fed with chopper control for its motoring and braking operations. Assuming continuous conduction calculate (i) The	[L3] [CO3] [12M]

		duty ratio of the chopper at rated torque with speed of 500 rpm for its motoring operation (ii) The duty ratio of the chopper at rated torque with speed of 500 rpm for its braking operation.	
4		Summarize the operation of dynamic braking for series & separately excited DC motor?	[L5] [CO3] [12M]
5		A separately excited dc motor is running at 1100rpm, 210V, with an armature resistance of 0.08. The initial speed of the motor is 1200rpm when broken by plugging, Take I_a=140A. (i) To limit the braking current to twice the full load value, calculate the resistance to be placed in armature circuit. (ii) Calculate the braking torque, and when speed is reduced to zero, calculate the torque.	[L3] [CO3] [12M]
6		A 230V, 10A, 1500rpm separately excited dc motor with armature resistance of 1.5Ω motor operates under dynamic braking with chopper control. Braking resistance has a value of 15Ω. (i) Calculate the duty ratio of chopper for motor speed of 1200rpm and braking torque equal to 2 times the rated motor torque. (ii) What will be the motor speed for duty ratio of 0.6 and motor torque equal to twice the rated torque?	[L3] [CO3] [12M]
7		Discuss the operation of motoring & regenerative braking of series excited DC motor?	[L2] [CO3] [12M]
9		Explain the closed loop speed control of dc motor and show how it can be achieved by using a chopper.	[L5] [CO2] [6M]
10		Explain the operation of first quadrant chopper fed by separately excited DC motor with necessary waveforms.	[L2] [CO3] [12M]

UNIT –IV
CONTROL OF INDUCTION MOTOR

1	a	Explain voltage control method of Induction motor drive?	[L2] [CO4] [6M]
	b	A 3-Ø star-connected 400V,50Hz, 4-pole induction motor has the following per phase parameters referred to the stators: R_1=0.15Ω, X_1=0.45Ω, R_2'=0.12Ω, X_2'=28.5Ω. Compute the stator current and power factor when the motor is operated at rated voltage and frequency with S=0.04.	[L3] [CO4] [6M]

2		Draw the characteristics of torque-speed and explain them?	[L2] [CO4][12M]
3	a	Explain stator- frequency control method?	[L2] [CO4] [6M]
	b	A 3-Ø, 400V, 50Hz, 6 pole star connected induction motor has the following parameters (referred to stator): $R_1=R_2=0.15\Omega, X_1=X_2=0.8\Omega$. Determine the initial braking torque if the motor is braked by plugging the full load the slip is 0.04.	[L4] [CO4] [6M]
4		Explain briefly Voltage source inverter control of induction motor?	[L2] [CO4] [12M]
5		Explain the speed control method for 3-Ø induction motor by using PWM controller.	[L3] [CO4] [12M]
6		Explain why the static Kramer drive can't be used for high speed ranges with neat sketch.	[L4] [CO4] [12M]
7	a	Comparison of VSI Drive with CSI Drive?	[L2] [CO4] [6M]
	b	Explain the closed loop speed control of 3-Ø induction motor drive..	[L3] [CO4] [6M]
8		Explain the operation of static rotor resistance control with waveforms.	[L2] [CO4] [12M]
9		Explain the speed control method for 3-Ø induction motor bu using Cycloconverter.	[L3] [CO4] [12M]
10		Explain the operation of static Scherbius drive with neat sketch.	[L3] [CO4] [12M]

UNIT –V
CONTROL OF SYNCHRONOUS MOTORS

1		Discuss the operation of a voltage source inverter fed synchronous motor Drive.	[L2][CO5][12M]
2	a	Explain the operation of self - control of synchronous motor.	[L2][CO5][6M]
	b	Discuss the operation of separate -control of synchronous motor.	[L2][CO5][6M]
3		Using a block diagram, explain the operation of a CSI fed synchronous motor drive.	[L2][CO5][12M]
4		Discuss about the operation of a Cycloconverter fed synchronous motor using suitable diagram.	[L2][CO5][12M]
5		Explain load commutated current source inverter fed synchronous motor.	[L2][CO5][12M]
6		Explain the closed loop control scheme of adjustable speed synchronous motor drive. Mention its need and advantages.	[L2][CO6][12M]
7		Explain load commutated Voltage source inverter fed synchronous motor.	[L3][CO5][12M]
8		A 5MW, 3 Phase 11 KV, star connected, 6 pole, 50 Hz, 0.9 leading power factor synchronous motor has synchronous reactance equal to 10Ω and	[L3][CO5][12M]

		armature resistance equal to 0Ω. The rated field current is 50 A. The machine is controlled by variable frequency control at constant V/F ratio up to the base speed and at constant voltage above base speed. Determine i. Torque and field current for the rated armature current, 750 RPM and 0.8 leading power factor ii. Armature current and power factor for half the rated motor torque, 1500 rpm and rated field current.	
9		A 3 phase, 400 Volt, 50 Hz, 6 pole, star connected, wound rotor synchronous motor has Z_s=0+j2 Ω. Load torque proportional to speed^2, is 340 NM at rated synchronous speed. The speed of the motor is lowered by keeping V/F constant maintain unity power factor by field control of the motor. For the motor operation at 600 rpm, calculate i. Supply voltage ii. Armature current iii. Excitation angle iv. Load angle	[L3][CO5][12M]
10		Explain variable frequency control of synchronous motor by PWM technique.	[L2][CO5][12M]

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UNIT – I

CONVERTER FED DC MOTORS

1. In ac - dc conversion, when the switch is closed then the sum of voltages around the loop is
(A) Zero (B) Non zero [ ]
(C) Equal to the sum of voltage when switch is open (D) Twice of the voltage when switch is open
2. A 3-ϕ semi controlled converter is ----- pulse converter [ ]
A)6 B)3 C) 12 D) 18
3. .A 3-ϕ fully controlled converter is operated at ---------- quadrant [ ]
A)single B) two C) four D) three
4.The back emf of a dc series motor is directly proportional to _____ [ ]
A) $V-I(R_a+R_{se})$ B) $V-IR_a$ C) $V+I(R_a+R_{se})$ D) $V+IR_a$
5.The thyristors in 3 phase converters are fired in sequence with phase difference of [ ]
A) 60^0 B) 90^0 C) 120^0 D) 180^0
6. In 3 phase converters each thyristor pair gate pulse is of _____ duration. [ ]
A) 60^0 B) 90^0 C) 120^0 D) 180^0
7. A phase-controlled, single-phase, full-bridge converter is supplying a highly inductive DC load. The converter is fed from a 230 V, 50 Hz, AC source. The fundamental frequency in Hz of the voltage ripple on the DC side is **GATE-2017** [ ]
A)25 B) 50 C) 100 D) 300
8.In three phase converters $\alpha=0^o$ at $\omega t=$ _____ [ ]
A) 0^o B) 60^o C) 90^o D) 180^o
9. In a 3-ϕ semi converter each thyristor conducts for a period of _____ [ ]
A) 60^o B) 90^o C) 120^o D) 150^o
10.1-ϕ half-controlled rectifier operates in ___ quadrant of V_a– I_a plane [ ]
A) First B) fourth C) both first and fourth D) both second and third
11.What is the necessity of controlled rectifier for dc drives? [ ]
A)To improve efficiency B)to improve reliability c)to control speed d)to improve performance
12.The expression for terminal voltage of dc motor in continuous conduction of 1-Φ fully controlled rectifier is **GATE-2010** [ ]
A) $\frac{V_m}{\Pi}\cos\alpha$ B) $\frac{2V_m}{\Pi}\cos\alpha$ C) $\frac{V_m}{\Pi}\sin\alpha$ D) $\frac{2V_m}{\Pi}\sin\alpha$

13.How many diodes are required for a single phase semi converter of separately excited D.C motor?
A) 1 B) 2 C) 3 D) 4 [ ]

14.The torque of a separately excited dc motor is directly propotional to _____ [ ]
A)I_a B)Ia^2 C)$\sqrt{I_a}$ D) none of these

15.In a fully controlled rectifier dc drive the motoring operation is for _____. [ ]
A) $\alpha=90^0$ B) $\alpha<90^0$ C) $\alpha>90^0$ D) $\alpha\geq90^0$

16.3-ϕ half-controlled rectifier operates in ___ quadrant of V_a– I_a plane [ ]
A) First B) fourth C) both first and fourth D) both second and third

17.The expression for terminal voltage of dc motor in continuous conduction of 3-Φ fully controlled rectifier is [ ]
A) $(\sqrt{2}V_m/\pi)\cos\alpha$ B) $(2V_m/\pi)\cos\alpha$ C) $(3\sqrt{3}V_m/\pi)\cos\alpha$ D) $(3\sqrt{3}V_m/\pi)(1+\cos\alpha)$

18.what is meant by electrical drive? [ ]
A) drives employed for electrical motors B)motion control C) drives employed for engines D) none of this

19.when a rectifier operation at an angle $\alpha>90^0$,va is negative.it means that the rectifier takes power from dc terminals and transfers it to ac mains.this operation of the rectifier is called _____ [ ]
A) conersion B) inversion C) linear D) non-linear

20.For natural commutation ,additional circulatory is_____ [ ]
A) Required B) not required C) both A&B D) none of these

21.In an single phase series dc motor drives, the flux Ø= [ ]
A) Ø= Ø+ Øres B) Ø= Øa+ Øres C) Ø= Øres D) Ø= Øa

22. As the firing angle of three phase semi converter drive connected to dc separately excited motor increases then the input power factor [ ]
A)decreases B) increases C) remains same D) can't say

23.In three phase semi controlled converters $\alpha=0^o$ at ωt= _____ [ ]
A) 0^o B) 30^o C) 60^o D) 90^o

24. In a 3-ϕ full controlled converters, $\alpha=0^0$,wt= _____ [ ]
A) 60^o B) 90^o C) 120^o D) 150^o

25.In a fully controlled rectifier dc drive the inverting operation is for _____. [ ]
A) $\alpha=90^0$ B) $\alpha<90^0$ C) $\alpha>90^0$ D) $\alpha\geq90^0$

26.In electrical braking stored energy of rotating part is converted in to electrical energy and dissipated in the form of_____. [ ]
A) voltage B) torque C) vaccum D) heat

27.If the converter operating as an inverter then the firing angle is ----- [ ]
A)$<90^0$ B) $>90^0$ C) 0 D) 180^0

28.for large power dc motor drives, _____controlled rectifiers are used. [ ]
A) semi B) fully C) half-wave D) none

29. given the expression for rms value of current(i_{rms}),when it is operated in a semi-converter_____ [ ]
A)$I_{rms}=I_a$ B) $I_{rms}=I_a+I_T$ C) $I_{rms}=Ia[\pi-\alpha/\pi]^{1/2}$ D) none of these

30. For a half controlled rectifier for continuous conduction mode,the output voltage cannot be reversed because the motor is in_____ **GATE-2015** [ ]
A)motoring operation B) generating operation C) both A&B D) none of these

31.Calculate the motor-torque when armature current I_a=38A,resistance,R_a=0.32Ω,V_s=260 v,and motor constant K_{arp}=0.182v/rpm [ ]

A) 6.621 N-M B) 66.21 N-M C) 0.6612 N-M D) 661.2 N-M

32. Calculate the motor back emf voltage when it is operated full converter for a separately excited dc motor,when Ia=38A,resistance Ra=0.32 Ω,V_s=260V and motor constant K_{arp}=0.182 v/rpm **GATE 2009** [ ]

A) 1.1942 v B) 91.42 v C) 0.191 v D) 1914.2 v

33.The semi-controlled converter is also called a _____ converter. [ ]

A) unidirectional B) bidirectional C) both A &B D) none of these

34.A three phase,three pulse type controlled converter is constructed using three SCR devices.The circuit is supplying an R load with $\alpha<30^0$.As such,each SCR device would conduct for [ ]

A) 60^0 each cycle B) 120^0 each cycle C) 180^0 each cycle D) 360^0 each cycle

35.A three phase ,three pulse controlled converter uses_____ no.of SCR's [ ]

A) 1 B) 2 C) 3 D) 4 **GATE-2011**

36.In three phase,3-pulse controlled converter has firing angle for one of the SCR set as 15^0.The SCR would start conducting at [ ]

A) 0^o B) 15^o C) 30^o D) 45^o

37.In single phase converters $\alpha=0^o$ at ωt= _____ [ ]

A) 0^o B) 60^o C) 90^o D) 180^o

38.In three phase ,3-pulseconverterwould operates as a line commutated inverter when **GATE-2013** [ ]

A) $30^o < \alpha < 60^o$ B) $90^o < \alpha < 180^o$ C) $90^o > \alpha$ D) it can never operates as a line commutated inverter

39.A fully controlled converter uses [ ]

A) diodes only B) thyristors only C) both diodes and thyristors D) none of these

40. A half-controlled single phase bridge rectifier is supplying an R-Lload.It is operated at a firing angle α and the load current is continuous.the fraction of cycle that the freewheeling diode conduct is **GATE 2012** [ ]

A) 1/2 B)$(1-\alpha/\pi)$ C) $\alpha/2\pi$ D) α/π

UNIT –II
FOUR QUADRANT OPERATION OF DC DRIVES

1.Which of the following is/are advantages of electric braking [ ]

A) less maintenance B) fast operation C) high efficiency D) all the above

2.In the which of the following braking, power is fed back to the supply **GATE-2003** [ ]

A) Regenerative braking B) dynamic braking C) Plugging D) all the above

3. During regenerative braking in a dc shunt motor its [ ]

A) $E_g > V$ B) $E_g < V$ C) $E_g = V$ D) $E_g \leq V$

4. In a 3-ϕ semi converter each thyristor conducts for a period of _____ [ ]

A) 60^o B) 90^o C) 120^o D) 150^o

5. In braking, motor works as [ ]

A) Transformer B) generator C) condenser D) motor itself

6.Which of the following is/are advantages of electric braking [ ]
A) less maintenance B) fast operation C) high efficiency D) all the above
7.which of the following are the braking methods. [ ]
A) Regenerative braking B) dynamic braking C) Plugging D) all the above
8. belt conveyors offer [ ]
A) zero starting torque B) high starting torque C) medium starting torque D) all of the above
9. power supply will be feedback to supply lines during_braking [ ]
A) regenerative B) rheostatic C) reverse current D)mechanical
10.A dual converter is a_____ quadrant converter. [ ]
A) 1 B) 2 C) 3 D) 4
11.To make dc machine operating in reverse motoring then_____. [ ]
A) V & I should be "-" B) V & I should be "+" C) V "+" and I "-" D) V "-" and I "+"
12.In a fully controlled rectifier dc drive the motoring operation is for _____. [ ]
A) $\alpha=90^0$ B) $\alpha<90^0$ C) $\alpha>90^0$ D) $\alpha\geq90^0$
13.In electrical braking stored energy of rotating part is converted in to electrical energy and dissipated in the form of_____. **GATE-2009** [ ]
A) voltage B) torque C) vaccum D) heat
14.power will be dissipated as heat during _____.braking. [ ]
A)regenerative B) rheostatic C)reverse current D)mechanical
15. most efficient method of braking system is [ ]
A)regenerative B) rheostatic C)reverse current D)mechanical
16. what is meant by plugging. [ ]
A) supply terminals are reverse B)supply terminals are disconnected
C)power flows from load to source D)all of these
17what are the braking methods used in a dc motor. [ ]
A) regenerative B) rheostatic C) plugging D)all of these [ ]
18. In simultaneous control of dual converter,both the rectifiers are controlled together in order to avoid_____. **GATE-2017** [ ]
A) ac circulating current b/n the rectifiers B) dc circulating current b/n the rectifiers C) leakage current b/n the rectifiers D) none of these.
19.which of the following is the best braking method? [ ]
A) friction B) electromechanical action C) eddy currents D) electric braking
20.plugging is used in ___ [ ]
A) small motors B)small and medium C) only in large machine D) everywhere
21.In dynamic braking,when braking is applied system the acts as [ ]
A) freely running machine B) motor with slow speed C) generator D) motor with same speed in opposite direction
22. In circulating current type of dual converter the nature of voltage across the reactor is _____ [ ]
A)pulsating B)alternating c)constant D)triangular

23. In a 3-phaseb dual converter, converter 1is operating with $\alpha_1=95^0$ then what is the firing angle of converter 2 _____ **GATE-2004**
A) 80^0 B) 85^0 C) 100^0 D) 180^0

24. The reactor is required in a circulating current type dual converter to _____ [ ]
A) to improve the p.f B) to limit the circulating current C) smoother the waveform D)increase the circulating current

25. dual converters handle _____during no-load [ ]
A) very high temperature B) no current C) only circulating current D) load current

26. If v01 and v02 are the dual converter output voltages then the reactor voltage is [ ]
A) $V0_1*V0_2$ B) $V0_1+V0_2$ C) $V0_1-V0_2$ D) none of these **GATE 2007**

27. A dual converter has [ ]
A) two full converters in series B) two half converters in series C) two full converters in anti parallel D) two half converters in anti parallel

28.The four quadrant operation of dual converters can be obtained by [ ]
A) moving the mechanical lever B) add inductance to the current C) changing the firing angle value D) none of these

29.To save energy during braking_____braking is used [ ]
A) dynamic B) plugging C)regenerating D) all of the above

30.In electrical braking stored energy of rotating part is converted in to electrical energy and dissipated in the form of_____. [ ]
A) voltage B) torque C) vaccum D) heat

31. _____was the first city in India to adopt electric traction. [ ]
A)delhi B) madras C) calcutta D) bombay

32.Which of the following braking method,the armature terminals are reversed [ ]
A)plugging B) dynamic braking C)regenerative braking D) all

33. Which braking is not possible in series motor? **GATE-2016** [ ]
A) Rheostat braking B) dynamic braking C) regenerative braking D) Counter electric current braking

34. Polarity of supply voltage is reversed in which type of braking? [ ]
A)plugging B) dynamic braking C)regenerative braking D) all

35. In which braking back emf exceeds supply voltage? [ ]
A)plugging B) dynamic braking C)regenerative braking D) all

36. In industries which electrical braking is preferred? [ ]
A)plugging B) dynamic braking C)regenerative braking D) all

37. The slip of an induction motor during DC rheostatic braking is **GATE-2014** [ ]
A) 2-S B) 1-S C) 2+S D) S

38.An elevator is required to operate in_____ [ ]
A) first quadrant B) second quadrant C) third quadrant. D) fourth quadrant

39. In 4 quadrant operation of a hoist 3rd quadrant represents [ ]
A) reverse motoring. B) reverse braking. C) forward braking D) forward motoring.

40. High braking torque produced in **GATE-2015** [ ]
A) plugging B) dynamic braking C)regenerative braking D) all

UNIT –III
CHOPPER FED DC MOTORS

1. The average value of the output voltage in a step - down dc chopper is given by [ ]
A) V 0 = Vs B) V 0 = D Vs C) V 0 = Vs / D D) V 0 = Vs / (1 - D)
GATE-2015

2. Choppers is a [ ]
A) AC - DC converters B) AC - AC converters C) DC - AC converters D) DC - DC converters

3. The control method used for PWM dc - dc converter is [ ]
A) Voltage mode control B) Current mode control C) Hysteric control D) all

4. A step - down choppers can be used in [ ]
A) Electric traction B) Electric vehicles C) Machine tools D) all

5. A reluctance motor [ ]
(A) is compact (B) has high cost (C) requires starting gear (D) is provided with slip rings.

6. Power factor in case of reluctance motor is [ ]
(A) nearly unity (B) always leading (C) 0.8 (D) 0.3 to 0.4.

7. The efficiency of reluctance motor is around [ ]
(A) 95% (B) 90% (C) 75 to 85% (D) 60 to 75%.

8. A reluctance motor on over-load runs as [ ]
(A) synchronous motor (B) induction motor (C) either of the two. D) all

9. The size of a excavator is usually expressed in terms of [ ]
(A) cubic meters (B) travel in meters (C) angle of swing (D) 'crowd' motion

10. Ward-Leonard controlled dc drives are generally used for [ ]
(A) light duty excavators (B) medium duty excavators (C) heavy duty excavators (D) all

11. In case of contactors, the contacts are generally made of [ ]
(A) copper (B) silver (C) cadmium copper (D) any of the above.

12. Which electromagnet is preferred for noiseless operation [ ]
(A) DC operated (B) AC operated (C) Any of the above. D) all

13. For high frequency choppers the device that is preferred is **GATE-2010** [ ]
(A) Thyristor (B) TRIAC (C) Transistor (D) GTO.

14. The number of operations per hour in case of class IV contactor will be around
(A) 100 (B) 600 (C) 900 (D) 1200.

15. In case of contactors, the duty in which the main contacts remain closed for a period bearing a definition relation to the no-load periods, is known as [ ]
(A) Standard duty (B) Intermittent duty (C) Temporary duty (D) Un-interrupted duty.

16. In case of contactors the ratio of the in service period to the entire period, expressed as a percentage is known as [ ]
(A) duty (B) load factor (C) class of contact (D) none of the above.

17. A class I contactor should be mechanically sound to withstand [ ]
(A) 0.05 million times (B) 0.25 million times (C) 1.2 million times (D) 5.0 million times.

18. Heat control switches find applications on [ ]
(A) three phase induction motors (B) single phase motors (C) transformers (D) cooling ranges.

19. A saturable core reactor can be used [ ]
(A) step less ac voltage variation (B) plugging of induction motor

(C) overload protection of transformers (D) all of the above.

20. In case of saturable core reactors, the power gain varies from [ ]
(A) 1 to 5 (B) 5 to 10 (C) 5 to 100 (D) 100 to 1000.

21. A magnetic amplifier can be used for the control of [ ]
(A) current (B) voltage (C) speed (D) all of the above.

22. An electric drive consists of **GATE-2012** [ ]
(A) motor, transmitting shaft and control equipment (B) motor and load
(C) motor, control equipment and load (D) motor, supply system and load.

23. In case of contactors, the contact chatter may be due to [ ]
(A) excessive jogging (B) broken pole shader
(C) poor contact in the control pick-up circuit (D) any of the above.

24. In a contactor overheating of contacts may result from any of the following except: [ ]
(A) Excess contact pressure (B) High inductive loads
(C) Copper oxide on contacts (D) Carrying load continuously for a long time.

25. In case of contactors, the magnet may become noisy due to [ ]
(A) dirt or rust on magnet faces (B) low voltage (C) broken pole shader (D) any of the above.

26. The failure of a thermal relay may occur due to [ ]
(A) motor and relay in different ambient temperatures (B) relay previously damaged by short circuit
(C) mechanical binding (D) any of the above.

27. Premature blowing of a fuse may occur due to [ ]
(A) heating at ferrule contacts (B) corrosion or oxidation of ferrules
(C) weak contact pressure (D) any of the above.

28. According to Indian Electricity rules, extra high voltage implies voltage exceeding [ ]
(A) 440 V (B) 650 V (C) 33 kV (D)110kV.

29. In case of low and medium voltage circuits, the permissible voltage variation is [ ]
(A) 1% (B) 5% (C) 12.5% (D) 20%.

30. Which of the following site will be preferred for earthing ? [ ]
(A) wet mashy ground (B) clayey soil
(C) loam mixed with small quantities of sand (D) damp and wet sand pit

31. Resistivity of earth increases sharply if the moisture falls below **GATE-2017** [ ]
(A) 70% (B) 50% (C) 40% (D) 20%.

32. Which of the following is least preferred for earthing ? [ ]
(A) earth mixed with salt and charcoal (B) dry earth
(C) marshy ground containing brine waste (D) clayey soil

33. Earth electrodes can be in the form of [ ]
(A) rods and pipes (B) strips (C) plates (D) any of the above.

34. A saturable core reactor is basically a [ ]
(A) variable resistor (B) step down transformer (C) thermal relay (D) variable impedance.

35. A step - down choppers can be used in [ ]
(A) Electric traction (B) Electric vehicles (C) Machine tools (D) All of these

36. The control method used for PWM dc - dc converter is [ ]
(A) Voltage mode control (B) Current mode control (C) Hysteric control (D) All of these

37. Choppers is a [ ]

(A) AC - DC converters (B) AC - AC converters
(C) DC - AC converters (D) DC - DC converters

38. The transfer function of PWM is generally developed in [ ]
(A) Time domain (B) Frequency domain (C) Either (a) or (b) (D) None of these

39. In the _____ type of chopper, two stage conversions takes place. [ ]
(A) AC-DC (B) AC link (C) DC link (D) None of the mentioned

40. Which device can be used in a chopper circuit? **GATE-2010** [ ]
(A) BJT (B) MOSFET (C) GTO (D) All of the mentioned

UNIT –IV
CONTROL OF INDUCTION MOTOR

1. In case of kiln drives [ ]
(A) starting torque is almost zero (B) starting torque and running torque are nearly equal
(C) starting torque is more than double of the running torque. (D) any of the above.

2. Motor preferred for kiln drives is usually [ ]
(A) slip ring induction motor (B) three phase shunt wound commutator motor
(C) cascade controlled ac motor (D) any of the above.

3. Belt conveyors offer **GATE-2013** [ ]
(A) zero starting torque (B) low starting torque
(C) medium starting torque (D) high starting torque.

4. In case belt conveyors [ ]
(A) squirrel cage motors with direct-on-line starters are used (B) dc shunt motors are used
(C) single phase induction motors are used (D) induction motors with star-delta starters are used.

5. Which of the following motor is preferred for blowers ? [ ]
(A) wound rotor induction motor (B) squirrel cage induction motor
(C) dc shunt motor (D) dc series motor.

6. Centrifugal pumps are usually driven by [ ]
(A) dc shunt motors (B) dc series motors
(C) squirrel cage induction motors (D) any of the above.

7. In case of centrifugal pumps the starting torque is generally [ ]
(A) double the running torque (B) slightly more than running torque
(C) same as running torque (D) less than running torque.

8. In a centrifugal pump if the liquid to be pumped has density twice that of water, then the horse power required (as compared to that while pumping water) will be [ ]
(A) half (B) same (C) double (D) four times.

9. Wound rotor and squirrel-cage motors with high slip which develop maximum torque at stand still are used for [ ]
(A) machine tools (B) presses and punches (C) elevators (D) all of the above.

10. Belted slip ring induction motor is almost invariably used for [ ]

(A) centrifugal blowers (B) jaw crushers (C) water pumps (D) screw pumps.

11. In jaw crushers, a motor has to often start against [ ]

(A) low load (B) medium load (C) normal load (D) heavy load.

12. Motor used for elevators is generally **GATE-2010** [ ]

(A) synchronous motor (B) induction motor

(C) capacitor start single phase motor (D) any of the above.

13. In synthetic fibre mills motor with [ ]

(A) constant speeds are preferred (B) high starting torque are preferred

(C) variable speed are preferred (D) low starting torque are preferred.

14. Which of the following motor is preferred for synthetic fibre mills ? [ ]

(A) series motor (B) reluctance motor

(C) shunt motor (D) synchronous motor.

15. Reluctance motor is a [ ]

(A) self-starting type synchronous motors (B) low torque variable speed motor

(C) variable torque motor (D) low noise, slow speed motor.

16. The consideration involved in the selection of the type of electric drive for a particular application depends on [ ]

(A) Speed control range and its nature (B) Starting torque

(C) Environmental conditions (D) All of the above.

17. Which of the following is preferred for automatic drives ? [ ]

(A) Synchronous motors (B) Squirrel cage induction motor

(C) Ward Leonard controlled dc motors (D) Any of the above.

18. Which type of drive can be used for hoisting machinery [ ]

(A) AC slip ring motor (B) Ward Leonard controlled DC shunt motor

(C) DC compound motor (D) Any of the above.

19. The motor normally used for crane travel is [ ]

(A) AC slip ring motor (B) Ward Leonard controlled DC shunt motor

(C) Synchronous motor (D) DC differentially compound motor.

20. A wound rotor induction motor is preferred over squirrel cage induction motor when the major consideration involved is **GATE-2017** [ ]

(A) high starting torque (B) low starting current

(C) speed control over limited range (D) all of the above.

21. When smooth and precise speed control over a wide range is desired, the motor preferred is

(A) synchronous motor (B) squirrel cage induction motor [ ]

(C) wound rotor induction motor (D) dc motor.

22. When quick speed reversal is a consideration, the motor preferred is [ ]

(A) synchronous motor (B) squirrel cage induction motor

(C) wound rotor induction motor (D) dc motor.

23. Stator voltage control for speed control of induction motors is suitable for [ ]

(A) fan and pump drives (B) drive of a crane

(C) running it as generator (D) constant load drive.

24. The selection of control gear for a particular application is based on the consideration of

(A) duty (B) starting torque [ ]

(C) limitations on starting current (D) all of the above.

25. As compared to squirrel cage induction motor, a wound rotor induction motor is preferred when the major consideration is [ ]
(A) high starting torque (B) low windage losses
(C) slow speed operation (D) all of the above.

26. A synchronous motor is found to be more economical when the load is above [ ]
(A) 1 kW (B) 10 kW (C) 20 kW (D)100kW.

27. The advantage of a synchronous motor in addition to its constant speed is [ ]
(A) high power factor (B) better efficiency
(C) lower cost (D) all of the above.

28. In motor circuit static frequency changers are used for [ ]
(A) power factor improvement (B) improved cooling
(C) reversal of direction (D) speed regulation.

29. In case of traveling cranes, the motor preferred for boom hoist is **GATE-2012** [ ]
(A) AC slip ring motor (B) Ward Leonard controlled DC shunt motor
(C) Synchronous motor (D) Single phase motor.

30. The characteristics of drive for. crane hoisting and lowering is [ ]
(A) smooth movement (B) precise control
(C) fast speed control (D) all of the above.

31. Motors preferred for rolling mill drive is [ ]
(A) dc motors (B) ac slip ring motors with speed control
(C) any of the above (D) none of the above.

32. The ....motors, because of their inherent characteristics, are best suited for the rolling mills
(A) dc motors (B) slip ring induction motors [ ]
(C) squirrel cage induction motors (D) single phase motors.

33. In which coil the emf generated will be more, for given flux distribution and number of turns
(A) Full pitch coil (B) Short pitch coil [ ]
(C) Long pitch coil (D) Equal emf will be generated in all cases.

34. Slip ring induction motor has **GATE-2015** [ ]
(A) Low starting torque (B) Medium starting torque
(C) High starting torque (D) None of these

35. In an induction motor, rotor speed is always [ ]
(A)Less than the stator speed (B)More than the stator speed
(C)Equal to the stator speed (D)None of these

36. In induction motor, greater the number of poles [ ]
(A) Lesser the speed (B) Greater the speed (C)Lesser the frequency (D)All of these

37. For the purpose of plugging [ ]
(A)N is positive w.r.t to Ns (B)N is zero (C)N is infinity (D)N is negative w.r.t to Ns

38. An induction motor is identical to [ ]
(A) D.C. compound motor (B) D.C. series motor
(C) Synchronous motor (D) Asynchronous motor

39. The efficiency of an induction motor can be expected to be nearly [ ]
(A) 60 to 90 % (B) 80 to 90 % (C) 95 to 98 % (D) 99 %

40. For driving high inertia loads best type of induction motor suggested is [ ]
(A) Slip ring type (B) Squirrel-cage type (C) Any of the above (D) None of the above

UNIT –V
CONTROL OF SYNCHRONOUS MOTORS

1. Synchronous motor can operate at [ ]
(A) Lagging power factor only (B) Leading power factor only
(C) Unity power factor only (D) Lagging, leading and unity power factor only.

2. An unexcited single phase synchronous motor is **GATE-2010** [ ]
(A) reluctance motor (B) repulsion motor
(C) universal motor (D) AC series motor.

3. The maximum power developed in the synchronous motor will depend on [ ]
(A) rotor excitation only (B) maximum value of coupling angle
(C) supply voltage only (D) rotor excitation supply voltage and maximum value of coupling angle.

4. In case the field of a synchronous motor is under excited, the power factor will be [ ]
(A) leading (B) lagging (C) zero (D) unity.

5. A synchronous motor is switched on to supply with its field windings shorted on themselves. It will
(A) not start (B) start and continue to run as an induction motor [ ]
(C) start as an induction motor and then run as synchronous motor (D)None

6. When the excitation of an unloaded salient pole synchronous motor gets dis connected [ ]
(A) the motor will burn (B) the motor will stop
(C) the motor will ran as a reluctance motor at the same speed
(D) the motor will run as a reluctance motor at a lower speed.

7. The damping winding in a synchronous motor is generally used **GATE-2014** [ ]
(A) to provide starting torque only (B) to reduce noise level
(C) to reduce eddy currents (D) to prevent hunting and provide the starting torque.

8. The back emf set up in the stator of a synchronous motor will depend on [ ]
(A) rotor speed only (B) rotor excitation only
(C) rotor excitation and rotor speed (D) coupling angle, rotor speed and excitation.

9. A synchronous machine has its field winding on the stator and armature winding on the rotor. Under steady running conditions, the air-gap field [ ]
(A) rotates at synchronous speed with respect to stator
(B) rotates at synchronous speed with direction of rotation of the rotor
(C) remains stationary with respect to stator
(D) remains stationary with respect to rotor.

10. Which of the following is an unexcited single phase synchronous motor ? [ ]
(A) A.C. series motor (B) Universal motor (C) Reluctance motor (D) Repulsion motor.

11. An over excited synchronous motor draws current at [ ]
(A) lagging power factor (B) leading power factor
(C) unity power factor (D) depends on the nature of load.

12. With the increase in the excitation current of synchronous motor the power factor of the motor will
(A) improve (B) decrease (C) remain constant (D) depend on other factors. [ ]

13. The armature current of a synchronous motor has large values for **GATE-2011** [ ]
(A) low excitation only (B) high excitation only
(C) both low and high excitation (D) depends on other factors.

14. A synchronous motor is switched on to supply with its field windings shorted on themselves. It will
(A) not start (B) start and continue to run as an induction motor [ ]
(C) start as induction motor and then run as a synchronous motor.

15. If the field of a synchronous motor is under excited, the power factor will be [ ]
(A) lagging (B) leading (C) unity. (D) None

16. When the excitation of an unloaded salient-pole synchronous motor suddenly gets disconnected
(A) the motor stops (B) it runs as a reluctance motor at the some speed [ ]
(C) it runs as a reluctance motor at a lower speed. (D) None

17. The armature current of the synchronous motor has large values for [ ]
(A) low excitation only (B) high excitation only
(C) both high and low excitation. (D) None

18. What is the ratio of no load speed to full load speed of a 200 kVA, 12 pole, 2200 V, 3 phase, 60 Hz synchronous motor ? [ ]
(A) 1 (B) 1.1 (C) 1.21 (D) infinite.

19. Which synchronous motor will be smallest in size ? [ ]
(A) 5 HP, 500 rpm (B) 5 HP, 375 rpm (C) 10 HP, 500 rpm (D) 10 HP, 375 rpm.

20. The maximum value of torque that a synchronous motor, can develop without losing its synchronism, is known as [ ]
(A) breaking torque (B) synchronizing torque (C) pull out torque (D) slip torque.

21. In a synchronous motor if the back emf generated in the armature at no load is approximately equal to the applied voltage, then [ ]
(A) the torque generated is maximum (B) the excitation is said to be zero percent
(C) the excitation is said to be 100% (D) the motor is said to be fully loaded.

22. If the field of a synchronous motor is under-excited, the power factor will be [ ]
(A) unity (B) lagging (C) leading (D) more than unity.

23. A 3 phase, 400 V, 50 Hz salient pole synchronous motor is fed from an infinite bus and is running at no load. Now if the field current of the motor is reduced to zero [ ]
(A) the motor will stop (B) the motor will run
(C) the motor will run at synchronous speed (D) the motor will run at less than synchronous speed.

24. The purpose of embedding the damper winding in the pole face is to [ ]
(A) eliminate hunting and provide adequate starting torque (B) reduce windage losses
(C) eliminate losses on account of air friction (D) reduce bearing friction.

25. In a 3 phase VSI out of eight valid states, the number of valid states that produce zero ac line voltages is/are **GATE-2015** [ ]
(A) One (B) two (C) Three (D) Four

26. In case of a synchronous motor we have [ ]
I. Load II. Speed III. DC excitation.
The magnitude of stator back emf depends on
(A) I only (B) I and II only (C) III only (D) I, II and III.

27. Which of the following motors is non-self starling ? [ ]
(A) squirrel cage induction motor (B) wound rotor induction motor
(C) synchronous motor (D) DC series motor.

28. The back emf in the stator of a synchronous motor depends on [ ]
(A) speed of rotor (B) rotor excitation

(C) number of poles (D) flux density.

29. Which motor can conveniently operate on lagging as well as leading power factor ? [ ]
(A) squirrel cage induction motor (B) wound rotor induction motor
(C) synchronous motor (D) any of the above.

30. A synchronous motor working on leading power factor and not driving any mechanical, is known
(A) synchronous induction motor (B) spinning motor [ ]
(C) synchronous condenser (D) none of the above.

31. The constant speed of a synchronous motor can be changed to new fixed value by [ ]
(A) changing the applied voltage (B) interchanging any two phases
(C) changing the load (D) changing the frequency of supply.

32. A 3 phase, 400 V, 50 Hz synchronous motor is operating at zero power factor lagging with respect to the excitation voltage. The armature reaction mmf. produced by the armature current will be
(A) demagnetizing (B) magnetizing (C) cross-magnetizing (D) none of the above. [ ]

33. In a synchronous motor, the torque angle is [ ]
(A) the angle between the rotating stator flux and rotor poles
(B) the angle between magnetizing current and back emf
(C) the angle between the supply voltage and the back emf (D) none of the above.

34. A 3 phase, 400 V, 50 Hz, 4 pole synchronous motor has a load angle of 10° electrical. The equivalent mechanical degrees will be 35. [ ]
(A) 10° (B)$5\sqrt{2}$ degrees (C) 5 degrees (D) 1 degree.

35. A 3 phase, 400 V, 50 Hz synchronous motor has fixed excitation. The load on the motor is doubled. The torque angle, φ_i will become nearly **GATE-2018** [ ]
(A) $\varphi_r /2$ (B) φ_r (C)$2\ \varphi_r$ (D) $\sqrt{2}\ \varphi_r$

36. The hunting in a synchronous motor takes place when [ ]
(A) friction in bearings is more (B) air gap is less (C) load is variable (D) load is constant.

37. V curves for a synchronous motor represent relation between [ ]
(A) field current and speed (B) field current and power factor
(C) power factor and speed (D) armature current and field current.

38. The breakdown. torque of a synchronous motor varies as [ ]
(A)1 /(applied voltage) (B) 1/(applied voltage)^2 (C) applied voltage (D) (applied voltage)^2.

39. Hunting in a synchronous motor cannot be due to [ ]
(A) variable frequency (B) variable load (C) variable supply voltage (D) windage friction.

40. When the excitation of an unloaded salient pole synchronous motor suddenly gets disconnected
(A) the motor stops (B) it runs as a reluctance motor at the same speed
(C) it runs at a reluctance motor at a lower speed. (D) None [ ]