NANDHA ENGINEERING COLLEGE

(Autonomous)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

17EEC07 - ELECTRICAL MACHINES II

QUESTION PATTERN TYPE - I

UNIT – 1

SYNCHRONOUS GENERATORS

S.No	Part – A	Marks	CO	BTL	Topic in Syllabus
1	Alternator consists of a. Slip rings and brush set up b. Commutator and brush set up c. Slip rings and Commutator d. None of the above Answer: a	**1**	**CO1**	**R**	Constructional details
2	Alternator stator core is made of thin laminated constructions, because a. To reduce the eddy current losses b. To reduce the mechanical losses c. To reduce the hysteresis losses d. To reduce the copper losses Answer: a	**1**	**CO1**	**R**	Constructional details
3	Alternator stator core is made up of high grade silicon steel materials, because a. To reduce the eddy current losses b. To reduce the mechanical losses c. To reduce the hysteresis losses d. To reduce the copper losses Answer: c	**1**	**CO1**	**R**	Constructional details
4	Alternator stator core lamination thickness is a. 0.1 to 0.5 c. 0.2 to .4 b. 0.4 to 0.5 d. 0.3 to 0.5 Answer: d	**1**	**CO1**	**R**	Constructional details

5	For large alternators ---------- excitation is used. a. DC c. Brushless b. AC d. None of these Answer: c	**1**	**CO1**	**R**	Constructional details
6	Which type of rotor has uniform air gap? a. Salient pole type b. Smooth cylindrical type c. Salient pole and non-salient pole type d. None of the above Answer: b	**1**	**CO1**	**R**	Types of rotor
7	For high speed applications ------- type alternators are used a. Salient pole b. Non-salient pole c. Poles projected type d. None of the above Answer: b	**1**	**CO1**	**R**	Types of rotors
8	Non-salient pole type is also called as a. Poles projected type b. Smooth cylindrical type c. Salient pole type d. None of the above Answer: b	**1**	**CO1**	**R**	Types of rotors
9	One pole pitch is a. 180^0 mechanical b. 120^0 mechanical c. 120^0 electrical d. 180^0 electrical Answer: d	**1**	**CO1**	**U**	Winding factors
10	1^0 mechanical = a. p electrical c. p/2 electrical b. 2p electrical d. p/3 electrical Answer: c	**1**	**CO1**		Winding factors
11	Frequency of induced emf of an alternator is	**1**	**CO1**	**U**	EMF equation

	a. f= pN/120 c. f= pN b. f= 120Np d. f= 120p/N Answer: a				
12	Formula for synchronous speed is a. Ns=120fp c. Ns=60f/p b. Ns=120p/f d. Ns=120f/p Answer: d	**1**	**CO1**	**U**	EMF equation
13	In star connection, an induced emf per phase is a. $E_{ph}=E_L/\sqrt{3}$ c. $E_{ph}=3E_L$ b. $E_{ph}=E_L$ d. $E_{ph}=\sqrt{3}E_L$ Answer: a	**1**	**CO1**	**U**	EMF equation
14	Alternators are varying under load due to a. Ra b. X_L c. armature reaction d. All the above Answer: d	**1**	**CO1**		Synchronous reactance
15	In alternators under resistive load-unity power factor, two fluxes oppose each other is called as a. Cross magnetizing effect b. Demagnetizing effect c. Magnetizing effect d. None of these Answer: a	**1**	**CO1**	**R**	Armature reaction
16	In alternators under inductive load-lagging power factor, two fluxes oppose each other is called as a. Cross magnetizing effect b. Demagnetizing effect c. Magnetizing effect d. None of these Answer: b	**1**	**CO1**	**R**	Armature reaction
17	In alternators under capacitive load-leading power factor, two fluxes oppose each other is called as a. Cross magnetizing effect b. Demagnetizing effect	**1**	**CO1**	**R**	Armature reaction

	c. Magnetizing effect d. None of these Answer: c				
18	The optimistic method of regulation determination in an alternator is a. EMF method c. ZPF method b. MMF method d. ASA method Answer: b	**1**	**CO1**	**U**	Voltage regulation
19	The pessimistic method of regulation determination in an alternator is a. EMF method c. ZPF method b. MMF method d. ASA method Answer: a	**1**	**CO1**	**U**	Voltage regulation
20	The EMF method of regulation in an alternator is also called as a. Potier triangle method b. Ampere Turns method c. Synchronous impedance method d. Modified MMF method Answer: c	**1**	**CO1**	**R**	Voltage regulation
21	The MMF method of regulation in an alternator is also called as a. Potier triangle method b. Ampere Turns method c. Synchronous impedance method d. Modified MMF method Answer: b	**1**	**CO1**	**R**	Voltage regulation
22	The ZPF method of regulation in an alternator is also called as a. Potier triangle method b. Ampere Turns method c. Synchronous impedance method d. Modified MMF method Answer: a	**1**	**CO1**	**R**	Voltage regulation

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	List the types of an alternator.	**2**	**CO1**	**R**	Constructional details
2	Compare salient pole and non-salient pole alternator.	**2**	**CO1**	**R**	Types of rotor
3	Why alternators are rated in kVA?	**2**	**CO1**	**U**	EMF equation
4	Define winding factor.	**2**	**CO1**	**R**	Winding factors
5	Define pole pitch and coil span.	**2**	**CO1**	**R**	Winding factors
6	Define pitch factor or coil span factor (Kc).	**2**	**CO1**	**R**	Winding factors
7	Define distribution factor (Kd).	**2**	**CO1**	**R**	Winding factors
8	Write down the emf equation of an alternator.	**2**	**CO1**	**U**	EMF equation
9	Write down the formula for frequency of induced emf in an alternator.	**2**	**CO1**	**U**	EMF equation
10	In alternators, short pitch winding is preferred over full-pitch winding. Justify.	**2**	**CO1**	**U**	Winding factors
11	Define armature reaction in an alternator.	**2**	**CO1**	**R**	Armature reaction
12	Define power angle (δ) of an alternator.	**2**	**CO1**	**R**	Synchronizing torque
13	Mention the conditions for parallel operation of an alternator.	**2**	**CO1**	**U**	Synchronizing and parallel operation
14	Define voltage regulation of an alternator.	**2**	**CO1**	**R**	Voltage regulation
15	List the methods for determining the regulation of an alternator.	**2**	**CO1**	**R**	Voltage regulation
16	Brief about capability curves.	**2**	**CO1**	**R**	Capability curves

S.No	Part – C & D	Marks	CO	BTL	Topic in Syllabus
1	Demonstrate the constructional details of alternator with two types of rotors.	**10**	**CO1**	**U**	Constructional details
2	Compare squirrel cage rotor with slip ring rotor.	8	**CO1**	**R**	Types of rotor
3	Portray about pitch factor and distribution factor of an alternator.	4	**CO1**	**R**	Winding factors
4	Derive the expression for EMF equation of an	7	**CO1**	**An**	EMF equation

<table>
<tr><td></td><td>alternator.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>Elucidate the synchronous impedance method of determining the regulation of an alternator.</td><td>8</td><td>CO1</td><td>U</td><td>Voltage regulation - EMF method</td></tr>
<tr><td>6</td><td>List the methods to predetermine the voltage regulation of synchronous machine and explain the MMF method.
(or)
Explicate the Ampere-Turn method of finding voltage regulation of an alternator.</td><td>12
(or)
10</td><td>CO1</td><td>U</td><td>Voltage regulation - MMF method</td></tr>
<tr><td>7</td><td>To calculate the voltage regulation of an alternator by POTIER method.</td><td>10</td><td>CO1</td><td>U</td><td>Voltage regulation - ZPF method</td></tr>
<tr><td>8</td><td>A 100KVA, 3000V, 50HZ, 3 phase star connected Alternator has effective armature resistance of 0.2 ohm. A field current of 50A produces short circuit current of 250A and open circuit EMF of 1250V. Calculate percentage regulation of 0.8 pf lagging and 0.6 pf leading. Draw the phasor diagrams for both conditions.</td><td>14</td><td>CO1</td><td>C</td><td>EMF method</td></tr>
<tr><td>9</td><td>A 1.1 MVA, 2.2 kV, 3φ star connected alternator gave the following test results during OC and SC tests.
<table>
<tr><td>Field current (A)</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td></tr>
<tr><td>Open circuit voltage (kV)</td><td>0.88</td><td>1.65</td><td>2.2</td><td>2.585</td><td>2.86</td></tr>
<tr><td>Short circuit current (A)</td><td>200</td><td>400</td><td>-</td><td>-</td><td>-</td></tr>
</table>The effective resistance of the 3φ winding is 0.22 Ω/phase. Estimate the full load voltage</td><td>12</td><td>CO1</td><td>C</td><td>MMF method</td></tr>
</table>

	regulation at 0.8 pf lagging by Ampere turns method.				
10	State and explain the conditions for parallel operation of alternators.	6	**CO1**	**U**	Parallel operation
11	Summarize the methods of synchronizing process in an alternator.	14	**CO1**	**U**	Synchronizing
12	Illustrate Blondel's theory of an alternator.	8	**CO1**	**U**	Two reaction theory

UNIT – 2

SYNCHRONOUS MOTOR

S.No	Part – A	Marks	CO	BTL	Topic in Syllabus
1	Synchronous motor is working based on a. Electromagnetic induction b. Magnetic locking c. Repulsion force d. None of these Answer: b	**1**	**CO2**	**R**	Principle of operation
2	Input power of the synchronous motor is a. $\sqrt{3}V_LI_LCOS\varphi$ c. $V_LI_LCOS\varphi$ b. $3V_LI_LCOS\varphi$ d. $V_{ph}I_{ph}COS\varphi$ Answer: a	**1**	**CO2**	**U**	Input and output power equations
3	Torque produced in the synchronous motor depends on the ---------. a. Phase angle ϕ b. impedance angle θ c. Load angle δ d. None of these Answer: c	**1**	**CO2**	**U**	Torque equation
4	In synchronous motor, torque developed is maximum a. When **δ=0** **c.** When **δ=90** b. When **δ=180** **d.** When **δ=180** Answer: c	**1**	**CO2**	**U**	Torque equation
5	In synchronous motor, condition for maximum power developed is a. $\theta=\varphi$ b. $\varphi=\delta$ c. $\theta=\pi$ d. $\theta=\delta$	**1**	**CO2**	**U**	Torque equation

	Answer: d				
6	In synchronous motor, $E_b < V$ is a. under excitation b. over excitation c. normal excitation d. critical excitation Answer: a	**1**	**CO2**	**U**	Operation on infinite bus-bar
7	In synchronous motor, $E_b > V$ is a. under excitation b. over excitation c. normal excitation d. critical excitation Answer: b	**1**	**CO2**	**U**	Operation on infinite bus-bar
8	In synchronous motor, $E_b = V$ is a. under excitation b. over excitation c. normal excitation d. critical excitation Answer: c	**1**	**CO2**	**U**	Operation on infinite bus-bar
9	Output power equation of synchronous motor is a. $P_m=VI_aCOS\varphi-I_a^2R_a$ b. $P_m=3VI_aCOS\varphi-I_a^2R_a$ c. $P_m=3VI_aCOS\varphi-3I_a^2R_a$ d. $P_m=VI_a-I_a^2R_a$ Answer: a	**1**	**CO2**	**U**	Input and output power equations
10	Synchronous condenser or capacitor is used for synchronous motor is a. Speed developed b. Torque developed c. Power factor improvement d. Regulation improvement Answer: c	**1**	**CO2**	**R**	Synchronous condenser
11	Under excitation means a. Lagging power factor	**1**	**CO2**	**R**	Operation on infinite bus-bar

	b. Leading power factor c. Unity power factor d. All the above Answer: a				
12	Over excitation means a. Lagging power factor b. Leading power factor c. Unity power factor d. All the above Answer: b	**1**	**CO2**	**R**	Operation on infinite bus-bar
13	In current locus for constant power developed, a. $(P_m)max = V^2/4R_a$ b. $(P_m)max = V/4R_a^2$ c. $(P_m)max = V^2/2R_a$ d. $(P_m)max = V^2$ Answer: a	**1**	**CO2**	**U**	Current loci for constant input, constant excitation and constant power developed

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	State the working principle of synchronous motor.	**2**	**CO2**	**R**	Principle of operation
2	Write down the torque equation of synchronous motor.	**2**	**CO2**	**U**	Torque equation
3	Define infinite bus bar.	**2**	**CO2**	**R**	Operation on infinite bus-bars
4	Mention the applications of synchronous motor.	**2**	**CO2**	**R**	Applications
5	Synchronous motor is not self-starting, Justify the answer.	**2**	**CO2**	**U**	Starting methods
6	Define torque angle.	**2**	**CO2**	**R**	Torque equation
7	Define pull in and pull out torque in synchronous motor.	**2**	**CO2**	**R**	Torque equation
8	Define starting torque.	**2**	**CO2**	**R**	Torque equation
9	Specify the role of damper winding in	**2**	**CO2**	**U**	Constructional details

	synchronous motor.				
10	List the starting methods of synchronous motor.	**2**	**CO2**	**R**	Starting methods
11	Mention the advantages of salient pole rotor in synchronous motor.	**2**	**CO2**	**R**	Constructional details
12	Classify the different excitations of a synchronous motor.	**2**	**CO2**	**R**	V and inverted V curves
13	Synchronous motor is a constant speed motor and always runs under synchronous speed only. Justify the answer.	**2**	**CO2**	**U**	Principle of operation
14	Engrave the importance of synchronous condenser. State its application.	**2**	**CO2**	**R**	Synchronous condenser

S.No	**Part – C & D**	**Marks**	**CO**	**BTL**	**Topic in Syllabus**
1	Demonstrate the construction and working principle of synchronous motor with neat sketch.	**14**	**CO2**	**U**	Constructional details - Principle of operation
2	Explicate various starting methods of a synchronous motor	**14**	**CO2**	**R**	Starting methods
3	Define the various torques associated with the synchronous motor.	**7**	**CO2**	**U**	Torque equation
4	Discuss about the synchronous motor connected to infinite bus bar.	**4**	**CO2**	**U**	Operation on infinite bus-bars
5	Explain V and inverted V curves of a synchronous motor.	**8**	**CO2**	**U**	V and inverted V curves
6	Derive an expression for the maximum torque developed per phase of a synchronous motor.	**8**	**CO2**	**An**	Torque equation
7	A 3-phase star-connected synchronous motor rated at 187 kVA, 2300V, 47A, 50Hz, 187.5 rpm has an effective resistance of 1.5Ω and a synchronous reactance of 20 Ω per phase. Determine the internal power developed by the motor when it is operating at rated current and 0.8 power factor leading.	**6**	**CO2**	**E**	Input and output power equations
8	A 6poles, 3phase, star connected synchronous motor has synchronous	**8**	**CO2**	**E**	Torque equation

	impedance of (0.5+j8.0) Ω per phase. When operating on 2.2 kV, 50 Hz, bus bars, its induced emf is 1.8kV. Calculate the maximum torque that can be developed at this excitation condition.				
9	A 1000kVA, 1100V, 3phase, star connected synchronous motor has an armature resistance and reactance of 3.5 Ω and 40 Ω per phase respectively. Determine the induced emf and angular retardation of the rotor when fully loaded at (i) unity pf (ii) 0.8 pf lagging (iii) 0.8 pf leading.	**14**	**CO2**	**E**	Input and output power equations
10	Elucidate how synchronous motor can be operated as a synchronous condenser. Draw a phasor diagram.	**8**	**CO2**	**C**	Synchronous condenser
11	Develop an expression for power delivered by a synchronous motor in terms of a load angle.	**8**	**CO2**	**C**	Input and output power equations

UNIT – 3

THREE PHASE INDUCTION MOTORS

S.No	Part – A	Marks	CO	BTL	Topic in Syllabus
1	In three phase induction motor, the stator windings are electrically displaced each other by a. 120^0 c. 180^0 b. 360^0 d. 0^0 Answer : a	**1**	**CO3**	**R**	Constructional details
2	In three phase induction motor the production of RMF is a. $\varphi_T = 2\varphi_m$ b. $\varphi_T = 0$ c. $\varphi_T = 1.5\varphi_m$ d. $\varphi_T = \varphi_m/2$ Answer : c	**1**	**CO3**	**U**	Constructional details
3	Which of the following motor is self-start?	**1**	**CO3**	**U**	Principle of operation

	a. Synchronous motor b. Three phase induction motor c. Single phase induction motor d. None of these Answer : b				
4	The squirrel cage rotor is also called as a. short circuited rotor b. slip ring rotor c. wound rotor d. None of these Answer : a	**1**	**CO3**	**R**	Constructional details
5	The slip ring rotor is also called as a. short circuited rotor b. wound rotor c. squirrel cage rotor d. None of these Answer : b	**1**	**CO3**	**R**	Constructional details
6	In three phase induction motor, radial ducts are provided for a. Heating c. flux producing b. Cooling d. speed controlling Answer : b	**1**	**CO3**	**U**	Constructional details
7	In squirrel cage motor, rotor conductors made of a. Steel c. Insulated Copper b. Brass d. aluminium bars Answer : d	**1**	**CO3**	**R**	Constructional details
8	Air gap is uniform and small in -------- a. Squirrel cage rotor b. Slip ring rotor c. Wound rotor d. None of these Answer : a	**1**	**CO3**	**R**	Constructional details
9	Slip speed of the motor = a. Ns b. N c. N-Ns d. Ns-N	**1**	**CO3**	**U**	Slip

	Answer : d				
10	Practically the three phase induction motor operates in the slip range of ----- a. 0.01 to 0.5 b. 0.001 to 0.005 c. 0.01 to 0.05 d. 0.1 to 0.5 Answer : c			**U**	Slip
11	Which motor is called as asynchronous motor? a. Synchronous motor b. Induction motor c. Both synchronous and induction motors d. None of these Answer : b	**1**	**CO3**	**R**	Slip
12	At starting of induction motor a. N=0, S=0 c. N=Ns, S=Sm b. N=0, S=1 d. N=Ns, S=0 Answer : b	**1**	**CO3**	**U**	Slip
13	In general three phase induction motor can be treated as a transformer, the transformation ratio is a. K= E1/E2=stator turns/rotor turns b. K= E1E2= stator turns*rotor turns c. K= E2/E1= rotor turns/ stator turns d. None of the above Answer : c	**1**	**CO3**	**U**	Slip
14	Condition for maximum torque in induction motor is a. S=0 c. S=X2/R2 b. S=R2X2 d. S=R2/X2 Answer : d	**1**	**CO3**	**U**	Condition for maximum torque
15	Full load torque is always ------ than maximum torque a. Greater c. less b. Equal d. None of these	**1**	**CO3**	**R**	Condition for maximum torque

	Answer : c				
16	In induction motor, when the S>1 the machine works in ------------ mode. a. Braking c. Generating b. Motoring d. All the above Answer : a	**1**	**CO3**	**U**	Torque-slip characteristics
17	In induction motor, when the slip lies between 0 < S < 1 the machine works in ------------ mode. a. Braking c. Generating b. Motoring d. All the above Answer : b	**1**	**CO3**	**U**	Torque-slip characteristics
18	In induction motor, when the S<1 the machine works in ------------ mode. a. Braking c. Generating b. Motoring d. All the above Answer : c	**1**	**CO3**	**U**	Torque-slip characteristics
19	Fall in speed from no load to full load of induction motor is a. > 5% c. 4 to 5% b. 4 to 10% d. 4 to 6% Answer : d	**1**	**CO3**	**U**	Torque-speed characteristics
20	In three phase induction motor, core losses combines a. Eddy current and hysteresis losses b. Eddy current and copper losses c. frictional and windage losses d. mechanical and copper losses Answer : a	**1**	**CO3**	**R**	Losses and efficiency
21	In three phase induction motor, variable loss consists of a. stator copper loss b. rotor copper loss c. Both stator and rotor copper losses d. None of these Answer : c	**1**	**CO3**	**R**	Losses and efficiency

22	From no load test -------- losses and from blocked rotor test -------- losses are determined. a. Constant loss and copper loss b. Copper loss and constant loss c. Constant loss and iron loss d. Iron loss and mechanical loss Answer : a	**1**	**CO3**	**U**	No-Load and Blocked rotor tests
23	In double cage rotor, the upper cage has ------- area and ------------ resistance a. Small area and small resistance b. Large area and small resistance c. Small area and large resistance d. Large area and large resistance Answer : c	**1**	**CO3**	**U**	Double cage induction motors
24	In double cage rotor, the lower cage resistance material is a. Brass c. aluminium b. Copper d. bronze Answer : b	**1**	**CO3**	**R**	Double cage induction motors
25	When the induction motor runs as an induction generator a. Runs equal to synchronous speed b. Runs below the synchronous speed c. Runs above the synchronous speed d. None of these Answer : c	**1**	**CO3**	**R**	Induction generator
26	Induction generators are used in a. Steel mills b. Wind mills c. Paper mills d. Sugar mills Answer : b	**1**	**CO3**	**U**	Induction generator

S.No	**Part – B**	**Marks**	**CO**	**BTL**	**Topic in Syllabus**

1	List the types of rotors of induction motors.	**2**	**CO3**	**R**	Constructional details
2	State the advantages of three phase induction motor.	**2**	**CO3**	**R**	Constructional details
3	A three phase induction motor does not run at synchronous speed, Justify.	**2**	**CO3**	**R**	Slip
4	Define slip and write its expression.	**2**	**CO3**	**U**	Slip
5	List the effect of slip on rotor parameters.	**2**	**CO3**	**U**	Slip
6	A three phase 4 pole 50 Hz induction motor is running at 1440 rpm. Determine the slip and slip speed.	**2**	**CO3**	**C**	Slip
7	On which factors the torque produced in an induction motor depends?	**2**	**CO3**	**U**	Torque
8	Write down the expression for the torque equation of three phase induction motor.	**2**	**CO3**	**U**	Torque
9	State the condition for maximum torque of a three phase induction motor and what the maximum torque is?	**2**	**CO3**	**U**	Condition for maximum
10	Draw the speed torque characteristics of three phase induction motor.	**2**	**CO3**	**C**	Torque-Speed characteristics
11	Mention the common losses occurring in three phase induction motor.	**2**	**CO3**	**R**	Losses and efficiency
12	State the applications of three phase induction motor.	**2**	**CO3**	**U**	Applications
13	Compare double cage motor with single cage motor.	**2**	**CO3**	**R**	Double cage induction motor
14	Give the importance of induction generator.	**2**	**CO3**	**R**	Induction generator

S.No	Part – C & D	Marks	CO	BTL	Topic in Syllabus
1	Describe the constructional features of squirrel cage and slip ring induction motors. Also discuss the merits and demerits.	**14**	**CO3**	**U**	Constructional details
2	Compare squirrel cage rotor with slip ring rotor with relevant sketches.	**12**	**CO3**	**R**	Types of rotor

3	Describe the principle of operation of a three phase induction motor with a neat sketch.	**7**	**CO3**	**U**	Principle of operation
4	Develop an equivalent circuit of a three phase induction motor. Represent the various parameters associated with this.	**14**	**CO3**	**An**	Equivalent circuit
5	Derive the torque equation for a three phase induction motor.	**7**	**CO3**	**C**	Torque –slip characteristics
6	Derive the condition for the maximum torque in a three phase induction motors. Also obtain the expression for maximum torque.	**8**	**CO3**	**C**	Condition for maximum torque
7	Sketch and explain the torque slip characteristics of the three phase induction motor.	**12**	**CO3**	**U**	Torque –slip characteristics
8	Which tests are required to be performed to obtain the data for the circle diagram? How these tests are performed?	**14**	**CO3**	**An**	No load and Blocked rotor tests-Circle diagram
9	Explicate in detail the construction of circle diagram of three phase induction motor.	**14**	**CO3**	**U**	Circle diagram
10	A 15kW, 400V, 50Hz, three phase star connected induction motor gave the following test results: No load test: 400V, 9A, 1310W Blocked rotor test: 200V, 50A, 7100W Stator and rotor ohmic losses at standstill are assumed equal. Draw the induction motor circle diagram and calculate (i) Line current (ii) Power factor (iii) Slip (iv) Torque and efficiency at full load.	**14**	**CO3**	**C**	Circle diagram

UNIT – 4

STARTING AND SPEED CONTROLOF THREE PHASE INDUCTION MOTOR

S.No	Part – A	Marks	CO	BTL	Topic in Syllabus
1	Starting current is -------- times the full load current	**1**	**CO4**	**U**	Need for starters

	a. 4 to 6 c. 3 to 5 b. 5 to 10 d. 5 to 8 Answer: d				
2	Starter is used to a. Start the motor b. Limit the starting current c. Stop the motor d. Control the speed Answer: b	**1**	**CO4**	**U**	Need for starters
3	Star delta starter is used for a. DC motor b. Synchronous motor c. Squirrel cage motor d. Slip ring induction motor Answer: c	**1**	**CO4**	**R**	Types of starters - Star delta starter
4	Rotor resistance starter is used for a. DC motor b. Synchronous motor c. Squirrel cage motor d. Slip ring induction motor Answer: d	**1**	**CO4**	**R**	Types of starters - Rotor resistance starter
5	Which starter has tapping and change over switch a. DOL motor b. Star Delta starter c. Autotransformer starter d. Rotor resistance starter Answer: c	**1**	**CO4**	**R**	Types of starters - Autotransformer starter
6	Which is cheapest method of starting a three phase induction motor a. Rotor resistance starter b. Star Delta starter c. Autotransformer starter d. None of these Answer: b	**1**	**CO4**	**R**	Types of starters - Star delta starter

7	Direct online starter is used for ---- a. Small capacity motors <5 HP b. Medium capacity motors 6 -10 HP c. Large capacity motors >10HP d. None of these Answer: a	**1**	**CO4**	**U**	Types of starters – DOL
8	In Star-Delta starter, at start the stator winding is connected in star connection, hence per phase voltage gets reduced by the factor is a. √3 b. 3 c. 1/3 d. 1/√3 Answer: d	**1**	**CO4**	**U**	Types of starters - Star-Delta starter
9	Speed control of three phase induction motor can be controlled by a. Stator side only b. Rotor side only c. Both Stator and Rotor sides d. None of these Answer: c	**1**	**CO4**	**R**	Speed control
10	V/f control method is a. Stator side control b. Rotor side control c. Both Stator and Rotor control d. None of these Answer: a	**1**	**CO4**	**R**	Speed control - V/f control
11	Cascade control method is e. Stator side control f. Rotor side control g. Both Stator and Rotor control h. None of these Answer: b	**1**	**CO4**	**R**	Cascaded connection
12	While controlling the speed of an induction motor, the super synchronous speed is achieved by a. Slip frequency emf in phase with rotor induced emf b. Slip frequency emf anti phase with	**1**	**CO4**	**R**	Rotor resistance control

	rotor induced emf c. Slip frequency emf in phase with stator emf d. Slip frequency emf anti phase with stator emf Answer: a				
13	For very large motors above 4000kW such as steel rolling mills the preferable speed control method is a. Kramer system b. Scherbius system c. Static Scherbius system d. None of these Answer: a	**1**	**CO4**	**U**	Slip power recovery scheme

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	State the need of starter in induction motor.	**2**	**CO4**	**U**	Need for starters
2	Name the type of starters used in three phase induction motors.	**2**	**CO4**	**R**	Types of starters
3	State the drawbacks of Star-Delta starter.	**2**	**CO4**	**R**	Star-Delta starter
4	The rotor rheostat starter unsuited for a squirrel cage motor, Justify.	**2**	**CO4**	**An**	Rotor resistance starter
5	List the various methods of speed control of three phase induction motor.	**2**	**CO4**	**R**	Speed control
6	Write down the methods to control the speed of three phase induction motor from its rotor side.	**2**	**CO4**	**R**	Speed control
7	Define V/f ratio of speed control.	**2**	**CO4**	**U**	V/f control
8	Delineate pole changing method.	**2**	**CO4**	**R**	Pole changing
9	Identify the term cascading of motor or cascade control.	**2**	**CO4**	**R**	Cascaded connection
10	State the disadvantage of rotor rheostat speed control method.	**2**	**CO4**	**U**	Rotor resistance control
11	State two advantages of speed control of induction motor by injecting an EMF in	**2**	**CO4**	**R**	Speed control

	the rotor circuit.				
12	Portray slip power recovery scheme.	**2**	**CO4**	**U**	Slip power recovery scheme

S.No	Part – C & D	Marks	CO	BTL	Topic in Syllabus
1	Enumerate the starters used for three phase induction motor.	**14**	**CO4**	**U**	Types of starters
2	Represent the name and functions of starters used for three phase induction motors. Illuminate star-delta starter in detail.	**14**	**CO4**	**An**	Need for starters- Types of starters- Star Delta starter
3	Describe the working of rotor resistance starter with neat sketch.	**7**	**CO4**	**U**	Rotor resistance starter
4	Demonstrate the construction and working of autotransformer starter.	**7**	**CO4**	**U**	Autotransformer starter
5	Explicate with neat sketch, the different methods of speed control in three phase induction motor.	**14**	**CO4**	**An**	Speed control
6	With neat sketches explain the stator side speed control methods in three phase induction motor.	**10**	**CO4**	**U**	Voltage control- frequency control- pole changing
7	With neat sketches explain the rotor side speed control methods in three phase induction motor.	**10**	**CO4**	**U**	V/f control- rotor resistance control- cascaded connection
8	A 3phase 6poles, 50Hz induction motor takes 60A at full load speed of 940 rpm develops a torque of 150N/m, the starting current at rated voltage is 300A. What is starting torque? If a star to delta starter is used determine the starting torque and starting current.	**8**	**CO4**	**An**	Speed control
9	Explain with neat circuit diagram the static scherbius drive system of slip power recovery scheme.	**14**	**CO4**	**U**	Slip power recovery scheme

UNIT – 5

SINGLE PHASE INDUCTION MOTOR

S.No	Part – A	Marks	CO	BTL	Topic in Syllabus
1	The power rating of single phase induction motor is a. Fractional horse power only b. From fractional HP to few HP c. Horse power only d. None of these Answer: b	**1**	**CO5**	**R**	Constructional details
2	Single phase induction motors are ---- a. Not-self starting b. Self- starting c. None of these Answer: a	**1**	**CO5**	**R**	Principle of operation
3	Single phase induction motors are not self-starting, it is explained with the help of a. Double field revolving theory b. Cross field theory c. Both a and b d. None of these Answer: c	**1**	**CO5**	**R**	Double field revolving theory
4	At start N = 0 and the resultant torque is a. Maximum c. full load b. Zero d. None of these Answer: b	**1**	**CO5**	**U**	Performance analysis
5	When centrifugal switch gets opened mechanically in split phase induction motor a. Gathers 100% b. Gathers 0 to 50% c. Gathers 75 to 80% d. Gathers 50% Answer: c	**1**	**CO5**	**U**	Starting methods
6	In split phase induction motors, the starting torque is a. Poor – 125 to 150% of T_{FL} b. Good – 25 to 50% of T_{FL}	**1**	**CO5**	**U**	Starting methods

	c. Zero d. None of these Answer: a				
7	The starting torque available in capacitor start induction motors is about a. 0 to 50% b. Equal to 50% c. 50 to 75% d. 50 to 100% Answer: d	**1**	**CO5**	**U**	Starting methods
8	Capacitor start induction motors is available up to a. 2 kW c.6 kW b. 5 kW d. None of these Answer: c	**1**	**CO5**	**U**	Starting methods
9	Shading bond is made up of a. Copper c. Brass b. Aluminium d. Tin alloys Answer: a	**1**	**CO5**	**R**	
10	Motors are cheap but have very low starting torque is ----- a. Split phase motor b. Capacitor start motor c. Shaded pole motor d. Universal motor Answer: c	**1**	**CO5**	**R**	Shaded pole motor
11	These are small capacity series motors which can be operated on DC or AC supply of same voltage with similar characteristics called a. Universal motors b. Repulsion motors c. SR motors d. Stepper motors Answer: a	**1**	**CO5**	**R**	Universal motor
12	The principle of repulsion motor is	**1**	**CO5**	**U**	Repulsion motor

	a. Electromagnetic induction b. Magnetic locking c. Repulsion between two magnetic fields d. None of these Answer: c				
13	In medical fields which DC motor is widely used? a. PMDC c. Brushed DC motor b. BLDC d. None of these Answer: b	**1**	**CO5**	**R**	BLDC motor

S.No	Part – B	Marks	CO	BTL	Topic in Syllabus
1	Single phase induction motor is not self-starting. Justify.	**2**	**CO5**	**U**	Principle of operation
2	Name the starting methods for single phase induction motor.	**2**	**CO5**	**R**	Starting methods
3	List out any four applications of single phase induction motor.	**2**	**CO5**	**R**	Constructional details
4	In many single phase induction motors centrifugal switches are provided, why?	**2**	**CO5**	**U**	Constructional details
5	Single phase induction motor has two windings on its stator. Justify.	**2**	**CO5**	**U**	Constructional details
6	Define double revolving field.	**2**	**CO5**	**R**	Double revolving field theory
7	Which parameters are obtained from the no load and blocked rotor tests of a single phase induction motor?	**2**	**CO5**	**U**	No load and Blocked rotor tests
8	State the function of capacitor in a single phase induction motor.	**2**	**CO5**	**R**	Starting methods
9	State the advantage of capacitor-start induction motor.	**2**	**CO5**	**U**	Starting methods
10	Mention the applications of capacitor-start induction motor.	**2**	**CO5**	**U**	Starting methods
11	How the directions of rotation of a capacitor run motor can reversed?	**2**	**CO5**	**U**	capacitor run motor operation

12	Portray about universal motors.	**2**	**CO5**	**R**	Universal motors
13	Write down the demerits of repulsion motor.	**2**	**CO5**	**R**	Repulsion motor
14	State the principle of reluctance motor.	**2**	**CO5**	**U**	Switched Reluctance motor
15	Depict about BLDC motor.	**2**	**CO5**	**R**	BLDC motor

S.No	**Part – C & D**	**Marks**	**CO**	**BTL**	**Topic in Syllabus**
1	Explicate the construction and working principle of single phase induction motor.	**8**	**CO5**	**U**	Constructional details
2	Formulate different methods of starting of single phase induction motor.	**14**	**CO5**	**U**	Starting methods
3	Describe about the double revolving field theory and operation of an induction motor.	**10**	**CO5**	**U**	Double field revolving theory and operation
4	Draw the equivalent circuit of single phase induction motor and discuss the experimental procedure to obtain its parameters.	**14**	**CO5**	**An**	Equivalent circuit
5	Explain with suitable diagrams the working principle of split-phase and capacitor start induction motor.	**12**	**CO5**	**U**	Starting methods
6	Explicate the construction and operation of shaded pole induction motor.	**14**	**CO5**	**U**	Shaded pole induction motor
7	Demonstrate the construction and operation of repulsion motor.	**10**	**CO5**	**U**	Repulsion motor
8	Exhibit the construction and operation of Universal motor.	**8**	**CO5**	**U**	Universal motor
9	Illustrate the construction and working of Switched Reluctance motor.	**14**	**CO5**	**U**	Switched Reluctance motor
10	Depict the operation of BLDC motor.	**7**	**CO5**	**U**	BLDC motor

Prepared by **Scrutiny by** **Approved by**