

University of Mumbai
Electrical AC Machines - I

Course Code: EEC 402

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1.	For carrying out parallel operation, transformers should have same X / R ratio in order to avoid
Option A:	inrush current
Option B:	circulating current
Option C:	leakage reactance
Option D:	insulation failure
2.	The maximum flux density in the core of a 250/3000 volts, 50 Hz single phase transformer is 1.2 wb/m^2 . If the emf per turn is 8 volts. Calculate the area of core
Option A:	0.01 m^2
Option B:	0.02 m^2
Option C:	0.03 m^2
Option D:	0.04 m^2
3.	Two transformers are connected in parallel. Transformer A is rated as 700 KVA and has its per phase impedance as $(2+j7) \text{ ohm}$, transformer B is rated as 900 KVA and has its per phase impedance as $(1+j6) \text{ ohm}$. If the load to be supplied is 1500 KVA at 0.8 lagging power factor, the active power supplied by transformer B will be
Option A:	628.91
Option B:	818.50
Option C:	571.46
Option D:	683.88
4.	An isolation transformer has primary to secondary turn ratio of
Option A:	1:2
Option B:	1:1
Option C:	2:1
Option D:	1:100
5.	The lamination of transformer core is to reduce
Option A:	Copper loss
Option B:	Eddy current loss
Option C:	Ohmic loss
Option D:	Core loss
6.	In three phase transformers, the third harmonics voltages are
Option A:	In time phase
Option B:	Time displaced by 120°
Option C:	Time displaced by 60°
Option D:	Time displaced by 180°
7.	Scott connections are used in _____
Option A:	three-phase to single phase transformation

Option B:	three-phase to two-phase transformation
Option C:	single phase to three-phase transformation
Option D:	single phase to two-phase transformation
8.	A bank of three single phase transformer can be used for obtaining the three- phase output. Three magnetic circuits produced in case of a bank of three single phase transformer and in case of a single 3phase transformer are ____
Option A:	Linked, independent
Option B:	Independent, linked
Option C:	Linked, linked
Option D:	Both are independent
9.	A 3- phase Induction Motor with its rotor blocked behaves similar to
Option A:	A DC Motor Short Circuited
Option B:	A transformer Short Circuited
Option C:	A transformer open circuited
Option D:	A DC Motor Open Circuited
10.	The No-load current in 3- phase Induction Motors is
Option A:	20 -60% of full load current
Option B:	2 -6% of full load current
Option C:	30 -50% of full load current
Option D:	3 -5% of full load current
11.	At no- loads, Induction Motors operate at low power factors, since
Option A:	the reluctance offered to mutual flux is more due to air-gap
Option B:	the reluctance offered to mutual flux is less due to air-gap
Option C:	the reluctance offered to mutual flux is zero due to air-gap
Option D:	the reluctance offered to mutual flux has no effect due to air-gap
12.	If unit Air gap Power is assumed and 's' be the slip, then the ratio of Air gap Power, Rotor ohmic loss and gross mechanical power developed respectively is given by
Option A:	1: 1- s : s
Option B:	1: s : 1-s
Option C:	1: s : (1-s / s)
Option D:	1: (1- s / s): s
13.	A 3-phase, 50 Hz induction motor with a synchronous speed of 3000 rpm, has a star-connected rotor winding, with an induced emf of 120 V at standstill, having a resistance of 0.2 ohms per phase and a standstill leakage reactance of 1 ohm per phase. The full load slip is 0.04. The starting torque is nearly
Option A:	53 N-m
Option B:	80 N-m
Option C:	26 N-m
Option D:	10 N-m
14.	During plugging, as soon as the motor comes to rest,
Option A:	Load must be disconnected
Option B:	stator must not be disconnected from the supply
Option C:	stator must be disconnected from the supply, otherwise the rotor starts rotating in the opposite direction

Option D:	stator must be disconnected from the supply, otherwise the rotor starts rotating in the same direction
15.	The starting torque of a capacitor–start induction–run motor is directly related to the angle ‘ α ’ between its two winding currents by the relation
Option A:	$\text{Cos}\alpha$
Option B:	$\text{Sin}\alpha$
Option C:	$\text{Tan}\alpha$
Option D:	$\text{Sin}\alpha/2$
16.	For the purpose of starting an induction motor, a star-delta switch is equivalent to an auto starter of ratio ----- percent
Option A:	33.3
Option B:	57.7
Option C:	73.2
Option D:	60
17.	According to the double field revolving theory any alternating quantity can be resolved into two rotating components. The directions and magnitudes of these components are:
Option A:	Same direction, each having magnitude equal to the maximum magnitude of alternating current
Option B:	Opposite direction, each having magnitude equal to the maximum magnitude of alternating current
Option C:	Opposite direction, each having magnitude equal to half of the maximum magnitude of alternating current
Option D:	Same direction, each having magnitude equal to half of the maximum magnitude of alternating current
18.	A centrifugal switch is used to disconnect starting winding when motor has
Option A:	Run for about 1 minute
Option B:	Run for about 5 minutes
Option C:	Picked up about 50 to 70 percent of rated speed
Option D:	Picked up about 10 to 25 percent of rated speed
19.	If an induction motor with certain ratio of rotor to stator slots, runs at 1/7 of the normal speed, the phenomenon will be termed as
Option A:	Humming
Option B:	Hunting
Option C:	Crawling
Option D:	Cogging
20.	An induction motor with 1000 r.p.m. speed will have
Option A:	8 poles
Option B:	6 poles
Option C:	4 poles
Option D:	2 poles
21.	Core flux in the transformer is
Option A:	Sinusoidal
Option B:	Triangular
Option C:	square wave

Option D:	flat-topped
22.	Short circuit test on transformers is conducted to determine
Option A:	Hysteresis losses.
Option B:	copper losses
Option C:	core losses
Option D:	eddy current losses
23.	What is the no-load current drawn by transformer?
Option A:	0.2 to 0.5 %
Option B:	2 to 5 %
Option C:	12 to 15 %
Option D:	20 to 30 %
24.	Copper losses is proportional to
Option A:	kVA
Option B:	square of kVA
Option C:	cube of kVA
Option D:	Square root of kVA
25.	Which of the following connections belongs to phasor group no. 4 (+30 ⁰)
Option A:	Yy0, Dd0
Option B:	Yy6, Dd6
Option C:	Yd1, Dy1
Option D:	Yd11, Dy11
26.	In Core type transformers LV and HV windings are arranged such that _____
Option A:	Half LV near the core and half HV outside LV on each limb
Option B:	LV on one limb and HV on the other
Option C:	Half LV outside the core and half HV inside LV on each limb
Option D:	LV and HV windings are sandwiched
27.	VA rating of open delta connection is _____
Option A:	$\sqrt{3} V_{ph} I_{ph}$
Option B:	$(1/\sqrt{3}) * V_{ph} I_{ph}$
Option C:	$3 V_{ph} I_{ph}$
Option D:	$2V_{ph} I_{ph}$
28.	If power transformer is connected in Yd11 then distribution transformer connected in_____
Option A:	Yd11
Option B:	Yd1
Option C:	Dy1
Option D:	Dy11
29.	In Scott connection, the main & teaser transformer must have a tapping in their primary windings at ____
Option A:	Middle & 0.866 respectively
Option B:	0.288 & 0.866 respectively
Option C:	Middle & 0.577 respectively

Option D:	0.577 & middle respectively
30.	By increasing external resistance in Slip Ring Induction Motor
Option A:	Both the magnitude of internal torque and the slip at which maximum torque occurs is unaffected
Option B:	Both the magnitude of internal torque and the slip at which maximum torque occurs is affected
Option C:	Magnitude of internal torque is affected, but the slip at which maximum torque occurs is unaffected
Option D:	Magnitude of internal torque is unaffected, but the slip at which maximum torque occurs is affected proportionally
31.	In a 3- phase Induction Motor, Power factor at the standstill is
Option A:	high
Option B:	low
Option C:	Unity
Option D:	Zero
32.	Working Slip Range of 3- phase Induction Motor is
Option A:	$0 < s \leq 1$
Option B:	$s < 0$
Option C:	$s > 1$
Option D:	$0 < s < 1$
33.	Under normal working conditions of 3- phase Induction Motor, the rotor core losses are negligible
Option A:	Due to constant speed
Option B:	Due to slip
Option C:	Due to very low frequency rotor current
Option D:	Due to constant stator current frequency
34.	The starting torque can be controlled
Option A:	In Slip Ring Induction Motor but not in Squirrel cage Induction Motor
Option B:	In Squirrel cage Induction Motor but not in Slip Ring Induction Motor
Option C:	Both in Squirrel cage Induction Motor and in Slip Ring Induction Motor
Option D:	Neither in Squirrel cage Induction Motor nor in Slip Ring Induction Motor
35.	When a 3- phase supply is provided to the 3- phase Induction Motor and the developed torque is zero, if the
Option A:	Rotor is at standstill
Option B:	Rotor rotates at a speed lesser than the synchronous speed in the direction of rotating magnetic field
Option C:	Rotor rotates at a speed greater than the synchronous speed in the direction of rotating magnetic field
Option D:	Rotor rotates at synchronous speed in the direction of rotating magnetic field
36.	If single-phasing of 3-phase induction motor occurs under running conditions, then it -----
Option A:	Will stall immediately
Option B:	Will keep running though with slightly increased slip
Option C:	May either stall or keep running depending on the load carried by it

Option D:	Will become noisy while it still keeps running
37.	Direct online starter also called D.O.L. starter is used for motor having capacity
Option A:	Less than 5 hp
Option B:	Less than 10 hp
Option C:	Greater than 10 hp
Option D:	For any capacity motor
38.	The starting torque and power factor of shaded pole Induction motor are
Option A:	High, Low
Option B:	Low, High
Option C:	Low, Low
Option D:	High, High
39.	The power factor of a single –phase induction motor is usually
Option A:	Lagging
Option B:	Always leading
Option C:	Unity
Option D:	Unity to 0.8 leading
40.	In order to develop high starting torque in 3- phase Induction Motor
Option A:	Stator power factor angle should be as small as possible
Option B:	Rotor power factor should be as small as possible
Option C:	Rotor power factor angle should be as small as possible
Option D:	Rotor power factor does not play any role
41.	A transformer can have regulation closer to zero
Option A:	on full-load
Option B:	on overload
Option C:	on leading power factor
Option D:	on zero power factor
42.	For the parallel operation of two single phase transformers, it is necessary that they should have
Option A:	same kVA rating
Option B:	same polarity
Option C:	same efficiency
Option D:	same number of turns on secondary side
43.	The leakage flux in a transformer depends upon the value of
Option A:	Frequency
Option B:	Mutual flux
Option C:	Load current
Option D:	Applied voltage
44.	Which of the following is the main advantage of an auto-transformer over a two-winding transformer?
Option A:	Hysteresis losses are reduced
Option B:	Saving in winding material
Option C:	Eddy losses are totally eliminated
Option D:	Copper losses are negligible

45.	delta/ Star connection is also called as _____
Option A:	30°-connection
Option B:	0°-connection
Option C:	-30°-connection
Option D:	30°/-30°-connection
46.	For carrying out parallel operation, 3 phase transformers must belong to same phasor group in order to avoid
Option A:	Leakage reactance
Option B:	Insulation failure
Option C:	Circulating current
Option D:	Inrush current
47.	_____ leads to a better understanding of internal behavior of transformer having independent & interlinked magnetic circuit.
Option A:	The knowledge of construction
Option B:	The knowledge of working principle
Option C:	The knowledge of excitation phenomenon
Option D:	The knowledge of harmonics
48.	Which of the following connections is most suitable and economical for small, high-voltage transformers?
Option A:	Delta-delta connection
Option B:	Star-star connection
Option C:	Star-delta connection
Option D:	Delta-star connection
49.	The No - load test on 3- phase Induction Motor gives the following parameters
Option A:	r_1, r_2, X_1, X_2
Option B:	$X_m, r_1, r_2, X_1, X_2, X_{nl}$ and Fixed losses
Option C:	X_m, r_1, r_2, X_1 and X_2
Option D:	X_{nl} and Fixed losses
50.	The voltage ratio of Induction Machine
Option A:	Includes winding factors k_{w1} and k_{w2} , because the windings are distributed
Option B:	does not include winding factors k_{w1} and k_{w2} , because the windings are distributed
Option C:	Includes winding factors k_{w1} and k_{w2} , because the windings are concentrated
Option D:	does not include winding factors k_{w1} and k_{w2} , because the windings are concentrated
51.	Induction Motors operate
Option A:	At unity power factor at no- load
Option B:	At high power factors at no- load
Option C:	At zero power factor at no- load
Option D:	At low power factors at no- load
52.	When a 3- phase supply is provided to the 3- phase Induction Motor and the developed torque is zero, if the
Option A:	Rotor is at standstill

Option B:	Rotor rotates at a speed lesser than the synchronous speed in the direction of rotating magnetic field
Option C:	Rotor rotates at a speed greater than the synchronous speed in the direction of rotating magnetic field
Option D:	Rotor rotates at synchronous speed in the direction of rotating magnetic field
53.	Air- gaps in Induction Motors are kept as small as possible, in order to
Option A:	keep magnetizing current high and thereby a poor power factor
Option B:	keep magnetizing current low and thereby a better power factor
Option C:	keep magnetizing current high and thereby a better power factor
Option D:	keep magnetizing current low and thereby a poor power factor
54.	A 3-phase, 2-pole, 50 Hz induction motor has star-connected rotor winding, having resistance of 0.2 ohms per phase and a standstill leakage reactance of 1 ohm per phase. The full load slip is 0.04. The rotor speed in rpm will be
Option A:	2880
Option B:	1440
Option C:	1500
Option D:	3000
55.	In a squirrel cage induction motor, torque with auto-starter is ----- times the torque with direct switching.
Option A:	K^2
Option B:	K
Option C:	$1/K^2$
Option D:	$1/K$
56.	After the starting, auxiliary winding of a single phase Induction motor is disconnected from supply , it continues to run only on ----- winding
Option A:	Rotor
Option B:	Compensating
Option C:	Field
Option D:	Running
57.	In a Capacitor start motor, the phase displacement between starting and running winding can be nearly
Option A:	10°
Option B:	30°
Option C:	60°
Option D:	90°
58.	Which of the following methods is easily applicable to control the speed of the squirrel-cage induction motor?
Option A:	By changing the number of stator poles
Option B:	Rotor rheostat control
Option C:	By operating two motors in cascade
Option D:	By injecting e.m.f. in the rotor circuit
59.	The speed of a squirrel-cage induction motor can be controlled by all of the following except
Option A:	Changing supply frequency

Option B:	Changing number of poles
Option C:	Changing winding resistance
Option D:	Reducing supply voltage
60.	At slip =1, if r_2 is the rotor resistance referred to stator, then the equivalent circuit of a 3- phase Induction Motor is similar to
Option A:	An open circuited 2-winding transformer
Option B:	A short circuited 2-winding transformer
Option C:	An open circuited synchronous motor
Option D:	A short circuited synchronous motor

DESCRIPTIVE QUESTIONS

1)	Write notes on Back-to-Back test on two identical transformers.
2)	Two 3- phase transformer, rated at 500 kVA and 450 kVA respectively, are connected in parallel to supply a load of 1000 kVA at 0.8 pf lagging. The per phase resistance & per phase leakage reactance of the first transformer are 2.5% & 6% respectively and of the second transformer 1.6% & 7% respectively. Calculate the kVA load & power factor at which each transformer operates.
3)	Derive the expression of copper saving in step down auto transformer.
4)	A 500 kVA, 1 phase transformer with 0.012 p.u resistance and 0.06 p.u reactance is connected in parallel with 250 kVA, 1 phase transformer 0.014 p.u resistance and 0.04 p.u reactance to share a load of 600 kVA at 0.8 p.f lagging, find the power factor and kVA shared by each transformers.
5)	A 3- ph, 4- pole, 1440 rpm, 50 Hz IM has a star connected rotor winding, having a resistance of 0.2 ohms per phase and a standstill reactance of 1 ohm per phase. When the stator is energized at rated voltage and frequency, the rotor induced emf at standstill is 120 V per phase. Calculate the rotor current, rotor power factor and torque both at starting and at full load and compare these results. If an external resistance of 1 ohm per phase is inserted in rotor circuit, calculate rotor current, rotor power factor and torque at the time of starting
6)	Explain with the help of phasor & connection diagram, How Scott connections are used to obtain two phase supply from three phase supply mains.
7)	The OC and SC test on a 10 KVA, 115/230 V, 50 Hz single phase transformer gave the following results. SC test: 20 V, 30 A, 100 W (On HV side) OC test: 125 V, 0.7 A, 50 W (On LV side) Calculate: (i) copper loss on full load (ii) Efficiency at 0.8 leading PF (iii) Half load efficiency at 0.8 leading PF (iv) Percentage regulation at full load at 0.9 leading PF
8)	Explain the effect of harmonics on a three phase transformer.
9)	Discuss the starting methods of single phase induction motor. Explain any one in detail.
10)	Explain in detail the shaded pole starting of single phase induction motor and its torque - speed characteristics.
11)	What are the parameters found from No Load and Blocked Rotor Tests of a 3- phase Induction Motor? Explain.

12)	Explain the Torque-speed characteristics in braking, motoring and generating regions of 3- ph IM
13)	What is the need of starter in an induction motor? Explain the autotransformer starter.
14)	Why the single phase induction motor is “not a self - starting motor”, explain in detail with the help of Double field revolving theory.
15)	What is the need of speed control of an induction motor? List the methods used for speed control of induction motor. Explain Pole changing method in detail.
16)	Explain the advantage of using tertiary winding in a bank of star-star transformers.
17)	Draw the phasor diagram of a 3- phase Induction Motor at standstill and at full load slip. And hence , give the remarks on the power factor
18)	What is the need of starter in a 3-phase induction motor? List the different types of starters.
19)	Write short notes on all day efficiency of transformer.
20)	Deduce the equivalent circuit of a 3- phase Induction Motor
21)	Explain clearly how a three-phase transformer Yd11 can be successfully operated in parallel with another transformer Dyl.
22)	Write short notes on all day efficiency of transformer.
23)	Deduce the equivalent circuit of a 3- phase Induction Motor
24)	Explain clearly how a three-phase transformer Yd11 can be successfully operated in parallel with another transformer Dyl.
25)	Derive the condition for maximum efficiency of transformer.
26)	Why is the exciting current of transformer non sinusoidal although the applied voltage is sinusoidal?
27)	A 3- phase, 50 Hz, 4 –pole Induction Motor has a full load slip of 0.03 with a rotor resistance of 0.3 ohms and rotor reactance of 1 ohms. It has a rotor emf of 100 V per phase at standstill. Calculate, a) Synchronous Speed b) rotor speed at standstill c) rotor speed at full load d) rotor emf at full load e) rotor power factor at Standstill