

ELECTRONICS & ELECTRICAL ENGINEERING

Suppliment for Online Examination

Free Along with the Book

S.E. (Mechanical / Automobile) Semester - II

Unit - V D.C. Machines

Unit - VI Three Phase Induction Motor



TECHNICAL[™]
PUBLICATIONS
An Up-Thrust for Knowledge

technical@vtubooks.com
www.technicalpublications.org

Unit V

D. C. Machines

Objective Questions & Answers for Online Examination

- Q.1** In electromechanical energy conversion _____ field is mainly used for transfer of energy.
 a electric
 b electromechanical
 c magnetic
 d none of these [Ans. : c]
- Q.2** The generator works on the principle of _____.
 a statically induced e.m.f.
 b mutual induction
 c dynamically induced e.m.f.
 d Kirchhoff's laws [Ans. : c]
- Q.3** The direction of induced e.m.f. in a generator is given by _____.
 a Fleming's right hand rule
 b Right hand thumb rule
 c Fleming's left hand rule
 d Cork screw rule. [Ans. : a]
- Q.4** In Fleming's right hand rule, the index finger indicates _____.
 a E.M.F. b lines of flux
 c direction of relative motion
 d current [Ans. : b]
- Q.5** If the angle between the plane of flux and plane of relative motion is 0° then the induced e.m.f. is _____.
 a zero
 b maximum
 c infinite
 d none of these [Ans. : a]
- Q.6** _____ provides mechanical support to the d.c. machine.
 a Poles
 b Armature
 c Yoke
 d Bearings [Ans. : c]
- Q.7** Yoke is made up of _____.
 a copper
 b aluminium
 c cast steel
 d cast iron [Ans. : d]
- Q.8** Air ducts are provided in armature core to _____.
 a increase the core area
 b cool the machine
 c to accommodate the winding
 d none of these [Ans. : b]
- Q.9** The generation of e.m.f. takes place in _____ of a d.c. machine.
 a armature winding
 b field winding
 c pole core
 d interpoles [Ans. : d]
- Q.10** The brushes are made up of _____.
 a copper
 b iron
 c silver
 d carbon [Ans. : d]
- Q.11** A. d.c. machine having _____ poles has four magnetic circuits.

- a 8 b 2
 c 4 d 16 [Ans. : c]

Q.12 The armature of a d.c. machine is laminated because ____.

- a to reduce hysteresis loss
 b to reduce eddy current loss
 c to reduce copper loss
 d to reduce mechanical loss [Ans. : b]

Q.13 The basic nature of induced e.m.f. in the armature is ____.

- a pure d.c. b A.C.
 c rotating
 d D.C. with pulsating d.c. [Ans. : b]

Q.14 The brushes are made up of soft material because ____.

- a it is easy to collect e.m.f.
 b they are rotating
 c to avoid wear and tear of commutator
 d to reduce friction losses [Ans. : c]

Q.15 The number of parallel paths equal to number of poles in ____ winding.

- a wave b distributed
 c concentrated d lap [Ans. : d]

Q.16 In wave type winding, the number of parallel paths of armature winding is ____.

- a P b 2
 c 4 d $\frac{P}{2}$ [Ans. : b]

Q.17 In an e.m.f. equation of a d.c. generator, Z indicates ____.

- a conductors b brushes
 c field turns d commutator segments
 [Ans. : a]

Q.18 The brush drop in d.c. machine is about ____ V/brush.

- a 2 b 4
 c 1 d zero [Ans. : c]

Q.19 ____ number of conductors constitute one turn.

- a 2 b 4
 c 1 d zero [Ans. : a]

Q.20 The function of commutator is ____.

- a collection of voltage
 b production of flux
 c production of torque
 d convert a.c. e.m.f. to d.c. [Ans. : d]

Q.21 Practically number of commutator segments is ____.

- a more than field coils
 b less than armature coils
 c equal to armature coils
 d less than field coils [Ans. : d]

Q.22 In a separately excited d.c. generator ____ is not necessary.

- a armature
 b residual magnetism
 c field flux
 d rotor [Ans. : b]

Q.23 In a shunt generator, which of the following relations is true ?

- a $I_a = I_L + I_{sh}$ b $I_L = I_a + I_{sh}$
 c $I_L - I_a = I_{sh}$ d $I_L + I_a + I_{sh} = 0$
 [Ans. : a]

Q.24 When the fluxes produced by series and shunt field windings help each other, the compound generator is called ____.

- a differential compound
 b long shunt compound
 c cumulatively compound
 d short shunt compound [Ans. : c]

Q.25 ____ generator is used for boosters on d.c. feeders.

- a D.C. series b D.C. shunt
 c Cumulatively compound
 d None of these [Ans. : a]

Q.26 ____ generator is used for battery charging.

- a D.C. series b D.C. shunt
 c Cumulatively compound
 d None of these [Ans. : b]

Q.27 The bearings used to support the rotor shaft are ____.

- a bush bearings b roller bearings
 c magnetic bearings
 d ball bearings [Ans. : d]

Q.28 In generators, lap winding is preferred for ____.

- a low voltage, low current
 b low voltage, high current
 c high voltage, low current
 d high voltage, high current [Ans. : b]

Q.29 In generators, wave winding is preferred for ____.

- a low voltage, low current
 b low voltage, high current
 c high voltage, low current
 d high voltage, high current [Ans. : c]

Q.30 In a d.c. generator, if speed of prime mover is halved and flux per pole is doubled, the induced e.m.f. will ____.

- a remain constant
 b increase by 2 times
 c increase by 4 times
 d none of these [Ans. : a]

Q.31 Residual magnetism is necessary in a d.c. ____.

- a shunt generator

- b separately excited generator
 c shunt motor
 d series motor [Ans. : a]

Q.32 The field winding of ____ generator has thin wire of large number of turns.

- a series b shunt
 c compound d none of these [Ans. : b]

Q.33 The field winding of ____ generator has thick wire of less number of turns.

- a series b shunt
 c compound d none of these [Ans. : a]

Q.34 In Fleming's right hand rule , the thumb indicates direction of ____.

- a e.m.f. b motion
 c flux d current [Ans. : b]

Q.35 In Fleming's right hand rule, the middle finger indicates direction of ____.

- a e.m.f. b motion
 c flux d current [Ans. : a]

Q.36 The magnitude of the induced e.m.f. in a d.c. generator is given by ____.

- a BIl b $B l v$
 c $\frac{BV}{l}$ d $\frac{BI}{l}$ [Ans. : b]

Q.37 ____ is the rotor in d.c. generator.

- a Field b Brushes
 c Yoke d Armature [Ans. : d]

Q.38 ____ provides low reluctance path to the flux.

- a Pole b Commutator
 c Yoke d Brushes [Ans. : c]

Q.39 The generation of e.m.f. takes place in ____ of a d.c. generator.

- a armature b field
- c commutator d brushes

[Ans. : a]

Q.40 ____ is stationary part in d.c. generator.

- a Armature b Commutator
- c Brushes d None of these

[Ans. : c]

Q.41 Commutator is made up of _____.

- a carbon b aluminium
- c cast iron d copper

[Ans. : d]

Q.42 The roller bearings are preferred for _____ generators.

- a small rating b heavy duty
- c self excited d separately excited

[Ans. : b]

Q.43 ____ is preferred for high current, low voltage capacity generators.

- a Wave winding b Lap winding
- c Fractional slot d None of these

[Ans. : b]

Q.44 ____ is preferred for high voltage, low current capacity generators.

- a Wave winding b Lap winding
- c Fractional slot d None of these

[Ans. : a]

Q.45 For a 4 pole d.c. generator with lap wound armature, the number of parallel paths is ____.

- a 1 b 6
- c 2 d 4 [Ans. : d]

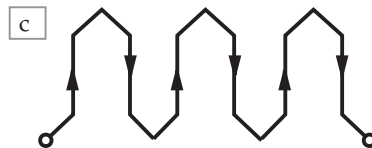
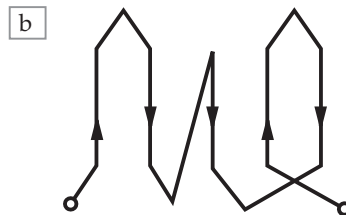
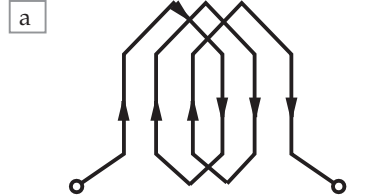
Q.46 For a 6 pole d.c. generator with lap wound armature, the number of parallel paths is ____.

- a 1 b 6
- c 2 d 4 [Ans. : b]

Q.47 For a 4 pole d.c. generator with wave wound armature, the number of parallel paths is ____.

- a 1 b 6
- c 2 d 4 [Ans. : c]

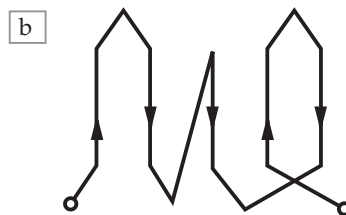
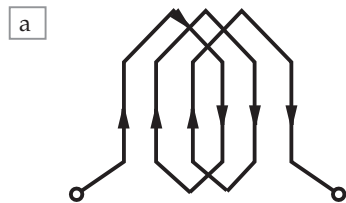
Q.48 _____ indicates wave type winding

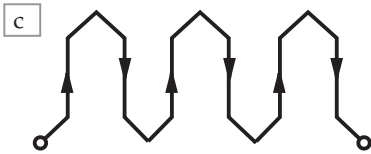


d None of these

[Ans. : c]

Q.49 _____ indicates lap type winding.





d None of these [Ans. : a]

Q.50 A d.c. generator has 400 conductors, 4 poles, lap wound armature then _____ number of conductors are in series.

- a 400 b 200
 c 100 d 50 [Ans. : c]

Q.51 A d.c. generator has 400 conductors, 4 poles, wave wound armature then _____ number of conductors are in series.

- a 400 b 200
 c 100 d 50 [Ans. : b]

Q.52 A d.c. generator has 800 conductors, 4 poles, lap wound armature then _____ number of conductors are in series.

- a 400 b 200
 c 100 d 50 [Ans. : b]

Q.53 A d.c. generator has 800 conductors, 4 poles, wave wound armature then _____ number of conductors are in series.

- a 400 b 200
 c 100 d 50 [Ans. : a]

Q.54 The e.m.f. equation of a d.c. generator is $E = \underline{\hspace{2cm}}$.

- a $\frac{\phi P}{NZA}$ b $\frac{\phi P 60}{NZA}$
 c $\frac{\phi PA}{60NZ}$ d $\frac{\phi PNZ}{60A}$ [Ans. : d]

Q.55 If number of conductors in a d.c. generator is Z then the total number of turns are _____.

- a Z b 2Z
 c $\frac{Z}{2}$ d 4 Z [Ans. : c]

Q.56 A 4 pole, 1500 rpm, d.c. generator has a lap wound armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04 Wb then the e.m.f. generated in the armature is _____V.

- a 480 b 120
 c 960 d 240 [Ans. : d]

Q.57 A 4 pole, 1500 rpm, d.c. generator has a wave wound armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04 Wb then the e.m.f. generated in the armature is _____V.

- a 480 b 120
 c 960 d 240 [Ans. : a]

Q.58 A 6 pole, d.c. generator has a wave wound armature having 40 slots with 5 conductors per slot. If the flux per pole is 8 mWb and the e.m.f. generated in the armature is 80 V then its speed is _____rpm.

- a 2000 b 1500
 c 1000 d 500 [Ans. : c]

Q.59 A 8 pole, d.c. generator has a lap wound armature having 400 armature turns. If the flux per pole is 10 mWb and the e.m.f. generated in the armature is 200 V then its speed is _____rpm.

- a 2000 b 1500
 c 1000 d 500 [Ans. : b]

Q.60 A 4 pole, 1000 rpm, d.c. generator has a wave wound armature having 500 armature turns. If the e.m.f. generated in the armature is 111.1 V then the flux per pole is _____mWb.

- a 3.33 b 10
 c 1.33 d 8 [Ans. : a]

Q.61 A 6 pole, 1000 rpm, d.c. generator has a wave wound armature having 40 slots with 5 conductors. If the e.m.f. generated in the armature is 80 V then the flux per pole is _____mWb.

- a 3.33 b 10
 c 1.33 d 8 [Ans. : d]
- Q.62** A 4 pole, 1200 rpm, d.c. generator has a lap wound armature producing 240 V e.m.f. in the armature with flux per pole as 0.02 Wb, then the total number of armature conductors are _____.
 a 2400 b 600
 c 1000 d 1200 [Ans. : b]
- Q.63** A 8 pole, 1500 rpm, d.c. generator has a wave wound armature producing 400 V e.m.f. in the armature with flux per pole as 4 mWb, then total number of armature conductors are _____.
 a 2400 b 600
 c 1000 d 1200 [Ans. : c]
- Q.64** A d.c. generator has an armature e.m.f. of 100 V when the useful flux per pole is 20 mWb and speed of 800 rpm. With the same flux and a speed of 1000 rpm the generator e.m.f. will be _____V.
 a 105 b 115
 c 135 d 125 [Ans. : d]
- Q.65** A d.c. generator has an armature e.m.f. of 100 V when the useful flux per pole is 20 mWb and speed of 800 rpm. With a flux per pole of 24 mWb and a speed of 90 rpm the generator e.m.f. will be _____V.
 a 105 b 115
 c 135 d 125 [Ans. : c]
- Q.66** A 4 pole d.c. generator with wave wound armature has 51 slots, each having 24 conductors. The flux per pole is 0.01 webers. The speed with which it must be rotated to give an induced e.m.f. of 220 V is _____r.p.m.
 a 539.21 b 428.75
 c 1025.68 d 746.52 [Ans. : a]
- Q.67** a 4 pole d.c. generator with lap wound armature has 51 slots, each having 24 conductors. The flux per pole is 0.01 webers. It is rotated at a speed of 539.21 rpm then the e.m.f. generated in the armature is _____V.
 a 220 b 110
 c 440 d 880 [Ans. : b]
- Q.68** In separately excited generator armature current is _____ load current.
 a more than b less than
 c same as d none of these
 [Ans. : c]
- Q.69** In d.c. generators _____ is smallest.
 a generated e.m.f.
 b terminal voltage
 c armature resistance drop
 d brush contact drop [Ans. : d]
- Q.70** In d.c. shunt generator armature current is _____ load current.
 a more than b less than
 c same as d none of these
 [Ans. : a]
- Q.71** In long shunt generator the field winding is connected across _____.
 a load
 b series combination of armature and series field
 c either (a) or (b)
 d both (a) and (b) [Ans. : d]
- Q.72** In short shunt generator the field winding is connected across _____.
 a series field b load
 c armature d none of these
 [Ans. : c]
- Q.73** The direction of force in a motoring action is determined by ____.

- a Fleming's right hand rule
 b end rule
 c Fleming's left hand rule
 d right hand thumb rule [Ans. : c]

Q.74 In Fleming's left hand rule, the middle finger indicates ____.

- a direction of rotation
 b direction of current
 c direction of flux
 d direction of force [Ans. : b]

Q.75 The back e.m.f. in a motor is due to ____.

- a generating action
 b motoring action
 c reverse action
 d none of these [Ans. : a]

Q.76 In a 240 V d.c. motor, the back e.m.f. is 220 V and $R_a = 0.5 \Omega$ then its armature current is ____.

- a 20 A b 10 A
 c 80 A d 40 A [Ans. : d]

Q.77 An electrical equivalent of gross mechanical power developed in a d.c. motor is ____.

- a $V I_L$ b $E_b I_L$
 c $E_b I_a$ d $E_b I_{sh}$ [Ans. : c]

Q.78 The condition for maximum power developed in a d.c. motor is ____.

- a $E_b = V$ b $E_b = 0.5 V$
 c $V = 0.5 E_b$ d $E_b = \sqrt{V}$
 [Ans. : b]

Q.79 A 4 pole d.c. motor has lap winding with 360 conductors. It takes armature current of 20 A and flux is 10 mWb. It develops gross torque of ____.

- a 11.44 Nm b 1.44 Nm
 c 8 Nm d 5.4 Nm
 [Ans. : a]

Q.80 As the speed of a d.c. motor increases, the armature current ____.

- a increases b decreases
 c remains same d none of these
 [Ans. : b]

Q.81 The armature torque is ____ that of shaft torque.

- a less than b same as
 c greater than d none of these
 [Ans. : c]

Q.82 The no load power drawn by a d.c. motor is used to overcome ____ losses.

- a constant b variable
 c copper d friction [Ans. : a]

Q.83 The speed of a d.c. motor is ____.

- a directly proportional to E_b
 b directly proportional to I_a
 c inversely proportional to flux
 d inversely proportional to R_a
 [Ans. : c]

Q.84 ____ motor has constant speed characteristics.

- a D.C. series b D.C. compound
 c D.C. shunt d None of these
 [Ans. : c]

Q.85 ____ motor cannot be started on no load.

- a D.C. series b D.C. compound
 c D.C. shunt d None of these
 [Ans. : a]

Q.86 ____ motor has best speed regulation.

- a D.C. series b D.C. compound
 c D.C. shunt d None of these
 [Ans. : c]

Q.87 ____ motor is used for rolling mills.

- a D.C. series b D.C. compound
 c D.C. shunt d None of these
 [Ans. : b]

Q.88 When constant speed and medium starting torque is necessary, _____ motor is used.

- a D.C. series b D.C. compound
 c D.C. shunt d None of these

[Ans. : c]

Q.89 As load current increases, the speed of _____ motor increases.

- a shunt
 b cumulative compound
 c series
 d differential compound [Ans. : d]

Q.90 _____ motor is not suitable for any practical application.

- a Shunt
 b Cumulative compound
 c Series
 d Differential compound [Ans. : d]

Q.91 When the motor carries the rated field current at the rated voltage then its speed is _____.

- a full load b no load
 c rated d none of these

[Ans. : c]

Q.92 _____ method is used to control the speed above rated.

- a Rheostatic control
 b Flux control
 c Armature diverter
 d None of these [Ans. : b]

Q.93 Easy and smooth speed control below rated is possible by _____ method of speed control.

- a rheostatic control
 b flux control
 c armature diverter
 d none of these [Ans. : a]

Q.94 Large power losses is the disadvantage of _____ method of speed control.

- a rheostatic control
 b flux control
 c armature diverter
 d none of these [Ans. : a]

Q.95 _____ method of speed control is commonly used for electric traction.

- a Field diverter
 b Armature diverter
 c Tapped field
 d Series-parallel grouping [Ans. : c]

Q.96 Condition for maximum efficiency for a d.c. motor is _____.

- a constant losses greater than variable losses
 b constant losses less than variable losses
 c friction losses equal to iron losses
 d constant losses equal to variable losses [Ans. : d]

Q.97 Which of the following application requires very high starting torque ?

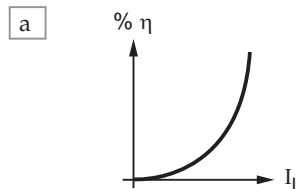
- a Air blower b Locomotive
 c Lathe machine d Fan [Ans. : b]

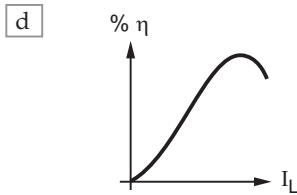
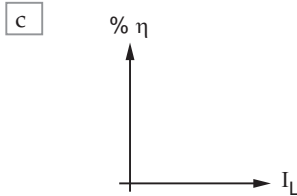
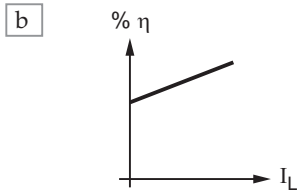
Q.98 The speed of d.c. motor falls from 1500 r.p.m. to 1425 r.p.m. from no load to full load then its speed regulation is _____.

- a 2.263 % b 1.263 %
 c 5.263 % d 10.263 %

[Ans. : c]

Q.99 Which of the following graphs represents efficiency of a motor ?





[Ans. : d]

Q.100 If the field of a d.c. shunt motor is opened while running then ____.

- a speed will reduce
 - b speed will be dangerously high
 - c motor will stop
 - d motor will run as it is
- [Ans. : b]

Q.101 If the back e.m.f. of a d.c. motor gets vanished suddenly during running then ____.

- a armature will burn
 - b field will burn
 - c motor will stop
 - d motor will make noise
- [Ans. : a]

Q.102 The back e.m.f. of a motor at the moment of starting is ____.

- a zero
 - b maximum
 - c low
 - d optimum
- [Ans. : a]

Q.103 The relationship between the applied voltage and back e.m.f. in D.C. motors is ____ .

- a $V = E_b + I_a R_a$
 - b $V = E_b - I_a R_a$
 - c $V = E_b$
 - d none of these
- [Ans. : a]

Q.104 Which D.C. motor will be preferred for constant speed line shafting ?

- a Cumulatively compound motor
 - b Differentially compound motor
 - c Shunt motor
 - d Series motor
- [Ans. : c]

Q.105 The speed of a d.c. shunt motor _____ from no load to full load.

- a falls slightly
 - b improves slightly
 - c remains unchanged
 - d falls rapidly
- [Ans. : a]

Q.106 'A current carrying conductor placed in a magnetic field experiences a force', is ____.

- a generating principle
 - b Lenz's law
 - c principle of energy conversion
 - d motoring principle
- [Ans. : d]

Q.107 In Fleming's left hand rule thumb indicates ____.

- a direction of motion
 - b direction of current
 - c direction of flux
 - d direction of force
- [Ans. : a]

Q.108 In Fleming's left hand rule index finger indicates ____.

- a direction of motion
 - b direction of current
 - c direction of flux
 - d direction of force
- [Ans. : c]

Q.109 For changing direction of rotation of a d.c. motor ____.

- a change the direction of current through field winding
- b change the direction of current through armature
- c either (a) or (b)
- d both (a) and (b) simultaneously

[Ans. : c]

Q.110 The expression for back e.m.f. in a d.c. motor is $E_b = \underline{\hspace{2cm}}$.

- a $\frac{\phi P Z}{60 A N}$
- b $\frac{\phi P N Z}{60 A}$
- c $\frac{\phi P A N}{60 Z}$
- d $\frac{\phi P A Z}{60 N}$

[Ans. : b]

Q.111 The voltage equation of a d.c. motor is $\underline{\hspace{2cm}}$.

- a $V = E + I_a R_a$
- b $E = V_t + I_a R_a$
- c $V - E + I_a R_a = 0$
- d none of these

[Ans. : a]

Q.112 The armature current in a d.c. motor is given by $\underline{\hspace{2cm}}$.

- a $\frac{V}{R_a} - E_b$
- b $\frac{V - E_b}{R_a}$
- c $V - \frac{E_b}{R_a}$
- d none of these

[Ans. : b]

Q.113 A 220 V d.c. motor has $R_a = 0.75 \Omega$. It draws armature current of 30 A then $E_b = \underline{\hspace{2cm}}$ V.

- a 207.5
- b 242.5
- c 197.5
- d 157.5

[Ans. : c]

Refer Fig. 5.1 for Q.114 to Q.118

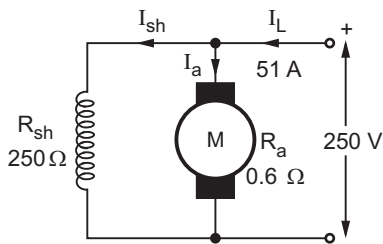


Fig. 5.1

The motor has 4 poles, lap connected armature with 400 armature conductors and flux per pole is 10 mWb.

Q.114 The field current $I_{sh} = \underline{\hspace{2cm}}$ A.

- a 2
- b 1
- c 3
- d 4

[Ans. : b]

Q.115 The armature current $I_a = \underline{\hspace{2cm}}$ A.

- a 49
- b 48
- c 52
- d 50

[Ans. : d]

Q.116 The back e.m.f. $E_b = \underline{\hspace{2cm}}$ V.

- a 220
- b 280
- c 240
- d 210

[Ans. : a]

Q.117 The speed at which motor runs is $\underline{\hspace{2cm}}$ r.p.m.

- a 1100
- b 2200
- c 3300
- d 4400

[Ans. : c]

Q.118 The motor is $\underline{\hspace{2cm}}$.

- a series
- b shunt
- c short shunt compound
- d long shunt compound

[Ans. : b]

Refer following data for Q.119 to Q.120.

A 4 pole d.c. motor has lap connected armature with $\phi = 30 \text{ mWb}$ and $Z = 250$. When connected to 230 V d.c. supply it draws $I_a = 40 \text{ A}$. Its $R_a = 0.6 \Omega$.

Q.119 The back e.m.f. of the motor is $\underline{\hspace{2cm}}$ V.

- a 206
- b 254
- c 184
- d 214

[Ans. : a]

Q.120 The speed of the motor is $\underline{\hspace{2cm}}$ r.p.m.

- a 2032
- b 1846
- c 3214
- d 1648

[Ans. : d]

Q.121 As motor is loaded $\underline{\hspace{2cm}}$.

- a its speed increases and back e.m.f. decreases

- b its speed decreases and back e.m.f. decreases
- c its speed decreases and back e.m.f. increases
- d its speed increases and back e.m.f. increases [Ans. : b]

Q.122 As motor load increases _____.

- a its speed decreases and I_a decreases
- b its speed increases and I_a decreases
- c its speed increases and I_a increases
- d its speed decreases and I_a increases [Ans. : d]

Q.123 $V = E_b + I_a R_a$ is the basic voltage equation of _____.

- a d.c. generator b induction motor
- c d.c. motor d synchronous motor [Ans. : c]

Q.124 If voltage equation of a d.c. motor is multiplied by _____ on both sides, we get power equation of d.c. motor.

- a R_a b I_a
- c N d V [Ans. : b]

Q.125 _____ is the power equation of d.c. motor.

- a $VI_a = E_b I_a + I_a^2 R_a$
- b $VR_a = E_b R_a + I_a R_a^2$
- c $VN = E_b N + NI_a R_a$
- d $VI_a = E_b^2 I_a + I_a^2 R_a$ [Ans. : a]

Q.126 $I_a^2 R_a$ are _____ of a d.c. motor.

- a iron losses
- b empirical constant
- c copper losses
- d universal constant [Ans. : c]

Q.127 The power is related to torque as _____

- a $P = \frac{T}{\omega}$ b $P = T\omega$

- c $P = \frac{\omega}{T}$ d none of these [Ans. : b]

Q.128 The torque equation of a d.c. motor is _____.

- a $T_a = \frac{\phi I_a P}{2\pi PZ A}$ b $T_a = \frac{\phi I_a P}{2\pi Z A}$
- c $T_a = \frac{\phi I_a Z}{2\pi P A}$ d $T_a = \frac{\phi I_a P Z}{2\pi A}$ [Ans. : d]

Q.129 A 4 pole d.c. motor takes $I_a = 50$ A. Its armature is lap connected with 480 conductors. The flux per pole is 20 mWb then gross torque is _____ Nm.

- a 76.4 b 46.7
- c 64.7 d 74.6 [Ans. : a]

Q.130 The speed of a d.c. motor is lowest on _____ condition.

- a no load b 70 % of full load
- c 10 % of full load
- d 100 % of full load [Ans. : d]

Q.131 The speed of a d.c. motor is highest on _____ condition.

- a no load b 70 % of full load
- c 10 % of full load
- d 100 % of full load [Ans. : a]

Q.132 A d.c. motor develops armature torque of 50 Nm at speed of 1200 r.p.m. then the power developed by armature is _____.

- a 60 kW b 6.283 kW
- c 0.398 kW d 2.95 kW [Ans. : b]

Q.133 The armature torque is _____ the shaft torque.

- a less than b equal to
- c more than d half of [Ans. : c]

Q.134 The losses taking place while supplying mechanical power developed from armature to a load are _____ losses.

- a friction and windage
 b copper c eddy current
 d hysteresis [Ans. : a]

Q.135 The power developed in armature on no load is used to supply _____ losses.

- a only friction and windage
 b only iron losses
 c both friction and windage with iron losses.
 d none of these

[Ans. : c]

Refer following data for Q.136 to Q.139.

A 4 pole, series motor has $Z = 944$, wave wound armature, flux/pole = 34.6 mWb, $T_a = 209$ Nm, $V = 500$ V and $R_a + R_{se} = 3\Omega$.

Q.136 The armature current of the motor is _____ A

- a 10.21 b 20.102
 c 31.42 d 16.86 [Ans. : b]

Q.137 The line current drawn from the supply is _____ A

- a 20.102 b 18.242
 c 36.18 d 5.46 [Ans. : a]

Q.138 The back e.m.f. developed is _____ V.

- a 488.26 b 455.49
 c 439.69 d 421.25 [Ans. : c]

Q.139 The speed of the motor is _____ rpm.

- a 518.2 b 642.9
 c 346.7 d 403.8 [Ans. : d]

Refer following data for Q.140 to Q.149.

A 60 kW, 400 V, d.c. shunt motor has 4 poles, wave wound armature with $Z = 450$. $\phi/\text{pole} = 45$ mWb, $R_a = 0.1\Omega$, $R_{sh} = 200\Omega$. The full load efficiency is 90.5 %.

Q.140 The input to the motor is _____ kW on full load.

- a 66.3 b 54.3
 c 48.6 d 72.18 [Ans. : a]

Q.141 The current drawn from the supply is _____ A.

- a 135.75 b 165.75
 c 121.5 d 180.45 [Ans. : b]

Q.142 The shunt field current is _____ A.

- a 1 b 0.5
 c 2 d 4 [Ans. : c]

Q.143 The armature current is _____ A.

- a 133.75 b 119.5
 c 178.45 d 163.75 [Ans. : d]

Q.144 The back e.m.f. is _____ V.

- a 383.625 b 388.05
 c 380.15 d 386.65 [Ans. : a]

Q.145 The electrical equivalent of gross mechanical power developed is _____ kW.

- a 58.75 b 62.82
 c 68.54 d 82.14 [Ans. : b]

Q.146 The speed of the motor is _____ r.p.m.

- a 603.87 b 475.111
 c 568.333 d 374.85 [Ans. : c]

Q.147 The gross torque developed in armature is _____ Nm.

- a 898.72 b 1136.45
 c 918.75 d 1055.45
 [Ans. : d]

Q.148 The mechanical losses are _____ kW.

- a 1.82 b 2.82
 c 3.82 d 4.82 [Ans. : b]

Q.149 The shaft torque is _____ Nm.

- a 1055.45 b 1103.63
 c 1008.13 d 875.67 [Ans. : c]

Q.150 Match the pairs

1. $T \propto I_a$	A. Series field winding
2. $T \propto I_a^2$	B. Shunt field winding
3. Resistance is high	C. Series motor
4. Resistance is low	D. Shunt motor

- a 1-D, 2-C, 3-B, 4-A
- b 1-C, 2-B, 3-D, 4-A
- c 1-B, 2-D, 3-A, 4-C
- d 1-A, 2-B, 3-C, 4-D

[Ans. : a]

Q.151 The speed of the d.c. motor is _____.

- a inversely proportional to E_b and directly proportional to ϕ
- b inversely proportional to E_b inversely proportional to ϕ
- c directly proportional to E_b inversely proportional to ϕ
- d directly proportional to E_b directly proportional to ϕ

[Ans. : c]

Q.152 _____ is the speed equation of a d.c. motor.

- a $N \propto E_b \phi$
- b $N \propto \frac{E_b}{\phi}$
- c $N \propto \frac{\phi}{E_b}$
- d $N \propto \frac{1}{E_b \phi}$

[Ans. : b]

Q.153 The ratio of change in speed from no load to full load to the full load speed is called _____ of d.c. motor.

- a speed manipulation
- b speed compensation
- c speed efficiency
- d speed regulation

[Ans. : d]

Q.154 The speed of a d.c. motor falls from 1200 r.p.m to 1000 r.p.m from no load then its speed regulation is _____ %.

- a 20
- b 10
- c 30
- d 25

[Ans. : a]

Q.155 A d.c. motor runs at 1000 rpm when $E_b = 320$ V. If flux is constant then its speed is _____ rpm when $E_b = 440$ V.

- a 1175
- b 1275
- c 1375
- d 1475

[Ans. : c]

Q.156 A d.c. motor runs at 800 r.p.m when $E_b = 205$ V. If its flux is reduced by 20 %, its speed is _____ r.p.m when $E_b = 195$ V.

- a 672.82
- b 951.3
- c 841.02
- d 760.97

[Ans. : b]

Q.157 A d.c. shunt motor takes armature current of 4 A while running at 1000 r.p.m. Its speed on full load is _____ r.p.m if its full load armature current is 48 A, $R_a = 0.3 \Omega$ and $V = 220$ V.

- a 1024.72
- b 544.28
- c 647.38
- d 939.67

[Ans. : d]

Q.158 A d.c. series motor takes 20 A while running at 800 r.p.m. Its speed is _____ if it takes 50 A current when $R_a + R_{se} = 0.5 \Omega$ and $V = 250$ V.

- a 300 r.p.m
- b 200 r.p.m
- c 900 r.p.m
- d 735 r.p.m

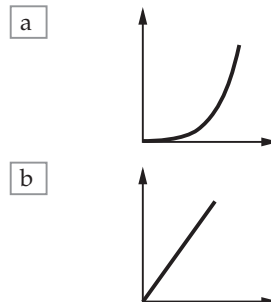
[Ans. : a]

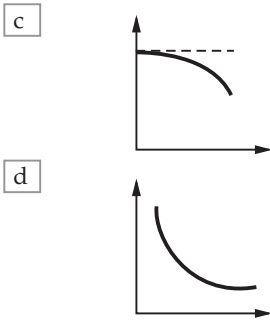
Q.159 A d.c. motor is still used in the industrial applications because it is _____.

- a cheap
- b simple in construction
- c provides fine speed control
- d none of these

[Ans. : c]

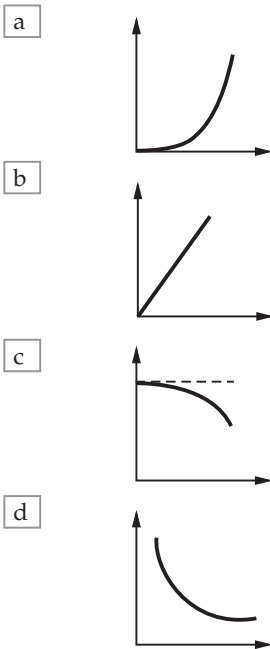
Q.160 _____ are the T Vs I_a characteristics of d.c. shunt motor.





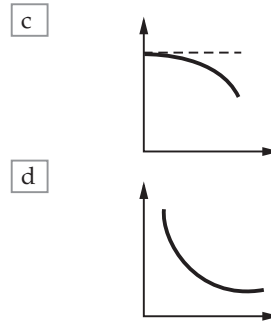
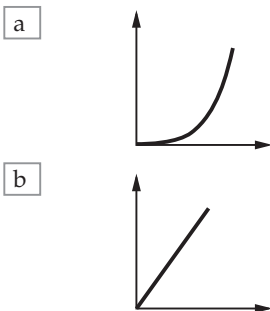
[Ans. : b]

Q.161 _____ are the T Vs I_a characteristics of d.c. series motor.



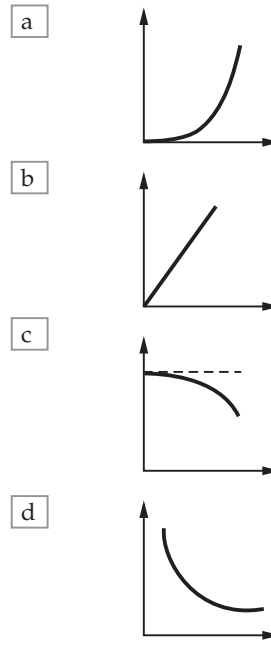
[Ans. : a]

Q.162 _____ are the speed against I_a characteristics of d.c. shunt motor.



[Ans. : c]

Q.163 _____ are the speed against I_a characteristics of d.c. series motor.



[Ans. : d]

Q.164 _____ represents d.c. series motor operation.

- a $N \propto \sqrt{I_a}$ b $N \propto \frac{1}{I_a}$
 c $N \propto V - I_a R_a$ d $N \propto I_a$ [Ans. : b]

Q.165 _____ represents d.c. shunt motor operation.

- a $N \propto \sqrt{I_a}$ b $N \propto \frac{1}{I_a}$
 c $N \propto V - I_a R_a$ d $N \propto I_a$ [Ans. : c]

Q.166 _____ represents d.c. series motor operation.

- a $T \propto I_a$ b $T \propto I_a^3$
 c $T \propto \sqrt{I_a}$ d $T \propto I_a^2$ [Ans. : d]

Q.167 _____ represents d.c. shunt motor operation.

- a $T \propto I_a$ b $T \propto I_a^3$
 c $T \propto \sqrt{I_a}$ d $T \propto I_a^2$ [Ans. : a]

Q.168 _____ represents d.c. series motor operation.

- a $N \propto \frac{1}{T}$ b $N \propto \frac{1}{\sqrt{T}}$
 c $N \propto \frac{1}{T^2}$ d $N \propto \sqrt{T}$ [Ans. : b]

Q.169 _____ is used for milling machine, drilling machine, blowers and fans.

- a D.C. compound motor
 b D.C. series motor
 c D.C. shunt motor
 d None of these [Ans. : c]

Q.170 _____ is used for rolling mills, heavy planers and punches.

- a Cumulative compound d.c. motor
 b D.C. shunt motor
 c Differential compound motor
 d d.c. series motor [Ans. : a]

Q.171 _____ is not suitable for any practical application

- a Cumulative compound d.c. motor
 b D.C. shunt motor
 c Differential compound motor
 d D.C. series motor [Ans. : c]

Q.172 A d.c. motor has $R_a = 0.2 \Omega$. If its supply voltage is 250 V and $E_b = 240$ V then its armature current at start is _____ A.

- a 50 b 1250
 c 850 d 40 [Ans. : b]

Q.173 The back e.m.f. is _____ at start in a d.c. motor.

- a zero b unity
 c equal to V d none of these [Ans. : a]

Q.174 _____ is limitation of three point starter.

- a NVC and field winding are in parallel.
 b NVC and field winding are in series.
 c It has only three terminals.
 d Cannot be used for high rated motors. [Ans. : b]

Q.175 _____ is advantage of four point starter.

- a NVC and field winding are in parallel.
 b NVC and field winding are in series.
 c It has only three terminals.
 d Cannot be used for high rated motors. [Ans. : a]

Q.176 _____ is limitation of four point starter.

- a NVC and field winding are in parallel.
 b NVC and field winding are in series.
 c Does not provide high speed protection.
 d Does not limit current at start. [Ans. : c]

Q.177 _____ is an electronic element used in solid state starter.

- a Op-amp b FET as switch
 c Thyristor d BJT as switch [Ans. : c]

Q.178 The Fig. 5.2 shows _____ method of speed control. (See Fig. 5.2 on next page)

- a armature voltage control.
 b supply voltage control
 c load control d flux control [Ans. : d]

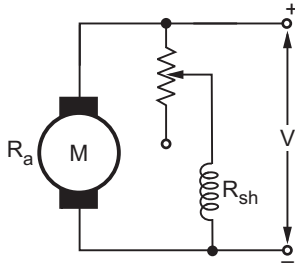


Fig. 5.2

Q.179 The Fig. 5.3 shows ____ method of speed control.

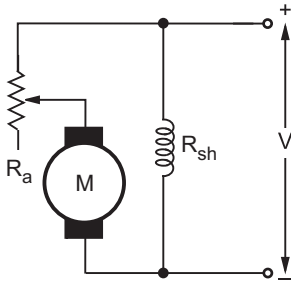


Fig. 5.3

- a armature voltage control
- b supply voltage control
- c load control
- d flux control

[Ans. : a]

Q.180 The Fig. 5.4 shows ____ method of speed control of d.c. series motor.

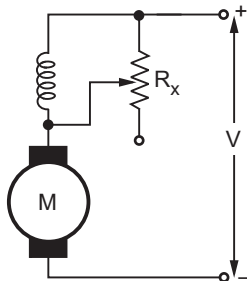


Fig. 5.4

- a tapped field
- b armature diverter
- c field diverter
- d rheostatic control

[Ans. : c]

Q.181 The Fig. 5.5 shows ____ method of speed control of d.c. series motor.

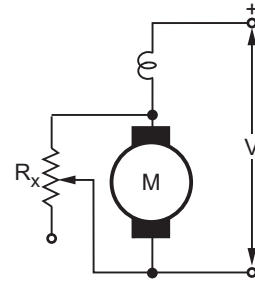


Fig. 5.5

- a tapped field
- b armature diverter
- c field diverter
- d rheostatic control

[Ans. : b]

Q.182 The Fig. 5.6 shows ____ method of speed control of d.c. series motor.

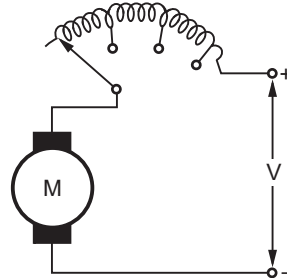


Fig. 5.6

- a tapped field
- b armature diverter
- c field diverter
- d rheostatic control

[Ans. : a]

Q.183 The Fig. 5.7 shows ____ method of speed control of d.c. series motor.

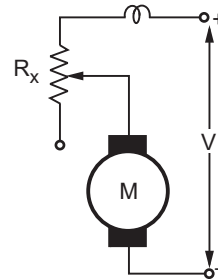


Fig. 5.7

- a tapped field
- b armature diverter
- c field diverter
- d rheostatic control

[Ans. : d]

□□□

Unit VI

Three Phase Induction Motor

Objective Questions & Answers for Online Examination

- Q.1** The rotor speed of a six pole 50 Hz induction motor is 960 r.p.m. The percentage slip is ____.
- a 3 % b 4 %
 c 5 % d 2 % **[Ans. : b]**
- Q.2** A 3-phase induction motor connected from a 3-phase, 50 Hz a.c. supply runs at 720 r.p.m. and has 4 % slip. The number of poles in the motor are ____.
- a 4 b 6
 c 8 d 16 **[Ans. : c]**
- Q.3** The torque developed in an induction motor is nearly proportional to ____ .
- a $1/V$ b V
 c V^2 d none of these
[Ans. : c]
- Q.4** The wound rotor induction motor is mainly used due to ____.
- a high starting torque
 b speed control
 c high rotor resistance
 d none of these **[Ans. : a]**
- Q.5** An induction motor works with ____ .
- a d.c. only b a.c. only
 c both a.c. and d.c.
 d none of the above **[Ans. : b]**
- Q.6** When a 3- ϕ supply is given to the stator of 3- ϕ induction motor, a _____ magnetic field is produced.
- a stationary b alternating
 c rotating d none of these
[Ans. : c]
- Q.7** The frame of induction motor is usually made of ____ .
- a silicon steel b cast iron
 c aluminium d bronze
[Ans. : b]
- Q.8** The number of poles in a 3- ϕ induction motor is determined by the ____ .
- a supply frequency
 b motor speed c supply voltage
 d both (a) and (b) **[Ans. : d]**
- Q.9** The air gap between the stator and the rotor of a 3- ϕ . I.M. ranges from ____.
- a 2 cm to 4 cm b 0.4 mm to 4 mm
 c 1 cm to 2 cm d 4 cm to 6 cm
[Ans. : b]
- Q.10** Phase wound induction motors are less extensively used than squirrel cage induction motors because ____.
- a slip rings are required on the rotor circuit
 b rotor windings are generally star connected
 c they are costly and require greater maintenance
 d none of the above **[Ans. : c]**

Q.11 Synchronous speed of three phase induction motor is given by ____ .

- a $N_s = 120 f P$ b $N_s = 120 f/P$
 c $N_s = 120 P/f$ d $N_s = f P/120$

[Ans. : b]

Q.12 The slip of an induction motor at stand still is ____ .

- a zero b one
 c infinity
 d none of the above

[Ans. : b]

Q.13 An induction motor under full load has a slip of about ____ .

- a 0.03 b 0.1
 c 0.3 d zero

[Ans. : a]

Q.14 A 4 pole, 440 V, 50 Hz induction motor is running at a slip 4 %. The speed of motor is ____ .

- a 1260 r.p.m. b 1440 r.p.m.
 c 1500 r.p.m. d 1560 r.p.m.

[Ans. : b]

Q.15 If N_s is the synchronous speed and 's' is the slip, then actual running speed of an induction motor will be ____ .

- a N_s b $s N_s$
 c $(1-s) N_s$ d $(N_s - 1) s$

[Ans. : c]

Q.16 In a 3- ϕ induction motor, the slip speed is given by ____ .

- a N_s b N
 c $N_s - N$ d $N - N_s$

[Ans. : c]

Q.17 A supply of 50 Hz is given to a 3- ϕ I.M. having 4 poles. If the I.M. runs at 1440 r.p.m. the slip is ____ .

- a 3 % b 4 %
 c 5 % d 3.33 %

[Ans. : b]

Q.18 A 4 pole, 50 Hz induction motor runs at a speed of 1440 r.p.m. The frequency of the rotor induced e.m.f. is ____ .

- a 3 Hz b 2.5 Hz
 c 2 Hz d 1 Hz

[Ans. : c]

Q.19 The relation between rotor frequency (f') and stator frequency (f) is given by ____ .

- a $f' = s f$ b $f' = f/s$
 c $f' = \sqrt{s} f$ d $f' = (1 - s) f$

[Ans. : a]

Q.20 A 3- ϕ , 440 V, 50 Hz, induction motor has 4 % slip. The frequency of rotor e.m.f. is ____ .

- a 200 Hz b 50 Hz
 c 2 Hz d 0.2 Hz

[Ans. : c]

Q.21 External resistance is connected to the rotor of a 3- ϕ phase wound induction motor in order to ____ .

- a reduce starting current
 b collector current
 c as a star connected load
 d none of these

[Ans. : a]

Q.22 The stator winding of three phase induction motor produces ____ magnetic field.

- a alternating b rotating
 c pulsating d constant

[Ans. : b]

Q.23 The magnitude of rotating magnetic field is ____ times the maximum flux of any individual phase.

- a 1.5 b $\sqrt{3}$
 c 2.5 d $\frac{1}{\sqrt{3}}$

[Ans. : a]

Q.24 ____ rotor is permanently short circuited.

- a Slip ring b Wound
 c Squirrel cage d Cup type

[Ans. : c]

- Q.25** For a 4 pole, 50 Hz, three phase induction motor, the synchronous speed is ____ r.p.m.
 a 1000 b 1200
 c 1800 d 1500 [Ans. : d]
- Q.26** Speed of the induction motor is ____ that of N_s .
 a greater than b less than
 c same as d none of these
[Ans. : b]
- Q.27** The slip speed of an induction motor is ____ r.p.m.
 a N_s b N
 c $N_s - N$ d $N - N_s$ [Ans. : c]
- Q.28** The value of slip is ____ at start.
 a zero b infinite
 c 100 d 1 [Ans. : d]
- Q.29** For a 6 pole, 50 Hz induction motor, the full load speed is 950 r.p.m. hence full load slip is ____.
 a 0.05 b 0.02
 c 0.01 d 0.08 [Ans. : a]
- Q.30** For a 4 pole, 50 Hz induction motor, the full load slip is 0.03 hence its full load speed is ____ r.p.m.
 a 1420 b 1455
 c 1495 d 1500 [Ans. : b]
- Q.31** In squirrel cage rotor, the slots are skewed ____.
 a to reduce losses
 b to give support
 c to reduce magnetic hum
 d to reduce friction [Ans. : c]
- Q.32** The slip rings are usually made up of ____.
 a copper b iron
 c carbon d phosphor-bronze
[Ans. : d]
- Q.33** A 440 V, 50 Hz induction motor has a slip of 5 % then the frequency of rotor currents is ____.
 a 1.5 Hz b 2.5 Hz
 c 0.5 Hz d 50 Hz [Ans. : b]
- Q.34** The rotor standstill resistance and reactance of an induction motor are 0.5 Ω and 2.5 Ω hence the rotor impedance at 5 % slip is ____.
 a 0.5 Ω b 0.025 Ω
 c 0.5154 Ω d 0.125 Ω
[Ans. : c]
- Q.35** The rotor power factor is ____ in nature.
 a unity b leading
 c zero d lagging
[Ans. : d]
- Q.36** In ____ motor, the speed can be controlled from rotor side.
 a a.c. series b slip ring
 c squirrel cage d universal
[Ans. : b]
- Q.37** An induction motor is a generalized ____.
 a generator b capacitor
 c transformer d none of these
[Ans. : c]
- Q.38** The condition for maximum torque is $s_m =$ ____.
 a $\frac{X_2}{R_2}$ b $\frac{R_2}{X_2}$
 c $R_2 X_2$ d none of these
[Ans. : b]
- Q.39** The magnitude of maximum torque is independent of ____.
 a rotor induced e.m.f.
 b rotor standstill reactance
 c rotor resistance
 d synchronous speed [Ans. : c]
- Q.40** In low slip region, the torque of an induction motor is ____.

- a directly proportional to the slip
 b inversely proportional to the slip
 c directly proportional to square of the slip
 d none of the above [Ans. : a]
- Q.41** In high slip region, the torque of an induction motor is _____.
 a directly proportional to the slip
 b inversely proportional to the slip
 c directly proportional to square of the slip
 d none of the above [Ans. : b]
- Q.42** If the rotor resistance is increased, the starting torque of slip ring induction motor _____.
 a decreases b remains same
 c increases d none of these
 [Ans. : c]
- Q.43** The direction of rotation of an induction motor depends on _____.
 a phase sequence
 b supply frequency
 c supply voltage d none of these
 [Ans. : a]
- Q.44** If any two phases of an induction motor are interchanged then _____.
 a motor will burn
 b motor will stop
 c motor speed will reduce
 d direction of rotation will change
 [Ans. : d]
- Q.45** The rotor of an induction motor rotates in the same direction as that of rotating magnetic field, according to _____.
 a Coulombs law b Lenz's law
 c Faraday's law d Ohm's law
 [Ans. : b]
- Q.46** In an induction motor, the number of rotor poles is _____.
 a greater than the stator poles
 b less than the stator poles
 c equal to the stator poles
 d zero [Ans. : c]
- Q.47** For a delta connected slip ring rotor, the number of slip rings required are _____.
 a 3 b 2
 c 1 d 0 [Ans. : a]
- Q.48** _____ induction motor is preferred when maintenance is the main consideration.
 a Slip ring b Wound rotor
 c Split phase d Squirrel cage
 [Ans. : d]
- Q.49** The rotor speed is more than the synchronous speed in a three phase induction motor when _____.
 a slip is positive b slip is negative
 c slip is zero d slip is one
 [Ans. : b]
- Q.50** If the synchronous speed of the 50 Hz induction motor is 750 r.p.m., it has _____ stator poles.
 a 8 b 4
 c 2 d 6 [Ans. : a]
- Q.51** A 4 pole induction motor is supplied from 50 Hz supply. Its speed on full load is 1410 r.p.m. then its full load slip is _____.
 a 2 % b 4 %
 c 6 % d 8 % [Ans. : c]
- Q.52** A 6 pole, 3 phase, 50 Hz induction motor has a full load slip of 5 % then its full load speed is _____ r.p.m.
 a 915 b 940
 c 900 d 950 [Ans. : d]

Q.53 _____ gives actual speed of the motor for slip s .

- a $N_s(1-s)$ b $\frac{N_s}{(1-s)}$
 c $s N_s$ d $\frac{(1-s)N_s}{s}$

[Ans. : a]

Q.54 If an induction motor running at 1400 r.p.m. is brought to rest then its slip changes to _____.

- a zero b one
 c infinite d very low

[Ans. : b]

Q.55 The rotor induced e.m.f. in running condition is _____ times rotor induced e.m.f. on standstill.

- a $1-s$ b $\frac{1}{s}$
 c s d $\frac{1-s}{s}$ [Ans. : c]

Q.56 The rotor reactance in running condition is _____ times the rotor reactance in standstill condition.

- a $1-s$ b $\frac{1}{s}$
 c s d $\frac{1-s}{s}$ [Ans. : c]

Q.57 The rotor reactance in standstill condition is _____ times the rotor reactance in running condition.

- a $1-s$ b $\frac{1}{s}$
 c s d $\frac{1-s}{s}$ [Ans. : b]

Use the following data for Q.58 to Q.63.

For a 4 pole, 3 phase induction motor the ratio of stator to rotor turns is 3. On a certain load its speed is 1455 r.p.m. and the supply voltage is 415 V.

Q.58 The synchronous speed of the motor is _____ r.p.m.

- a 1400 b 1000
 c 1500 d 2000 [Ans. : c]

Q.59 The slip for the given load is _____ %.

- a 2 b 3
 c 5 d 7 [Ans. : b]

Q.60 The frequency of the rotor induced e.m.f. in standstill condition is _____ Hz.

- a 50 b 2
 c 300 d 1.5 [Ans. : a]

Q.61 The frequency of the rotor induced e.m.f. in running condition is _____ Hz.

- a 50 b 2
 c 300 d 1.5 [Ans. : d]

Q.62 The rotor induced e.m.f. on standstill condition per phase is _____ V.

- a 79.86 b 239.6
 c 125.896 d 119.8 [Ans. : a]

Q.63 The rotor induced e.m.f. in running condition per phase is _____ V.

- a 3.594 b 1.524
 c 2.3958 d 1.789 [Ans. : c]

Q.64 The torque of a 3 phase induction motor depends on _____.

- a part of rotating magnetic field reacting with stator
 b rotor current in running condition
 c rotor power factor in running condition
 d all of these [Ans. : d]

Q.65 The constant 'k' in the torque equation of a 3 phase induction motor depends on _____.

- a supply voltage
 b rotor current in running condition
 c synchronous speed
 d all of these [Ans. : c]

Q.66 If the synchronous speed of a 3 phase induction motor is 1500 r.p.m. then the value of the constant 'k' in the torque equation is _____.

- a 0.019 b 0.091
 c 0.0568 d 25 **[Ans. : a]**

Q.67 A 3 phase induction motor is running with slip of 4 % having synchronous speed of 1500 r.p.m. If rotor induced emf per phase in standstill condition is 115.47 V and rotor impedance in standstill condition is $0.1 + j1$ ohms then its torque developed is _____ Nm.

- a 118.54 b 87.81
 c 225.45 d 67.29 **[Ans. : b]**

Q.68 The maximum torque in a 3 phase induction motor is _____ the rotor reactance.

- a directly proportional to
 b same as
 c inversely proportional to
 d independent of **[Ans. : c]**

Q.69 The maximum torque in a 3 phase induction motor is _____ the rotor resistance.

- a directly proportional to
 b same as
 c inversely proportional to
 d independent of **[Ans. : d]**

Q.70 The maximum torque in a 3 phase induction motor is _____ the rotor induced e.m.f. at standstill.

- a directly proportional to square root of
 b directly proportional to square of
 c inversely proportional to square root of
 d inversely proportional to **[Ans. : b]**

Q.71 _____ is true for 3 phase induction motor.

- a T_{max} is dependent on slip and rotor resistance
 b T_{max} is independent of slip and rotor resistance
 c T_{max} is dependent on slip but independent of rotor resistance
 d T_{max} is independent of slip but dependent on resistance **[Ans. : c]**

Q.72 In a torque-slip characteristics of 3 phase induction motor, the torque is _____ the slip in the low slip region.

- a directly proportional to
 b inversely proportional to
 c directly proportional to square of
 d independent of **[Ans. : a]**

Q.73 In a torque-slip characteristics of 3 phase induction motor, the torque is _____ the slip in the high slip region.

- a directly proportional to
 b inversely proportional to
 c inversely proportional to square of
 d independent of **[Ans. : b]**

Q.74 The nature of the torque-slip characteristics of 3 phase induction motor in low slip region is _____.

- a parabola
 b rectangular hyperbola
 c straight line d circle **[Ans. : c]**

Q.75 The nature of the torque-slip characteristics of 3 phase induction motor in high slip region is _____.

- a parabola
 b rectangular hyperbola
 c straight line d catenary **[Ans. : b]**

Q.76 The 3 phase induction motor always rotates at any point in _____.

- a low slip region
 b high slip region
 c region between $s = 1$ and $s = 2$
 d none of these [Ans. : a]

Q.77 _____ region of the torque-slip characteristics of 3 phase induction motor is called unstable region of operation.

- a Low slip region
 b High slip region
 c Region between $s = 1$ and $s = 2$
 d None of these [Ans. : b]

Q.78 _____ region of the torque-slip characteristics of 3 phase induction motor is called stable region of operation.

- a Low slip region
 b High slip region
 c Region between $s = 1$ and $s = 2$
 d None of these [Ans. : a]

Q.79 _____ shape of the torque-slip characteristics of 3 phase induction motor is called unstable region of operation.

- a Parabola b Circular
 c Straight line
 d Rectangular hyperbola [Ans. : d]

Q.80 _____ shape of the torque-slip characteristics of 3 phase induction motor is called stable region of operation.

- a Parabola b Circular
 c Straight line
 d Rectangular hyperbola [Ans. : c]

Q.81 A 3 phase induction motor is running with full load slip of 1.2 % and its rotor impedance per phase on standstill is $0.016 + j0.265$ ohms then the ratio of full load torque to maximum torque is _____.

- a 0.3824 b 3.162
 c 0.1203 d 0.5568 [Ans. : a]

Q.82 A 3 phase induction motor is running with full load slip of 1.2 % and its rotor impedance per phase on standstill is $0.016 + j0.265$ ohms then the ratio of starting torque to maximum torque is _____.

- a 0.3824 b 3.162
 c 0.1203 d 0.5568 [Ans. : c]

Q.83 A 3 phase induction motor is running with full load slip of 1.2 % and its rotor impedance per phase on standstill is $0.016 + j0.265$ ohms then the ratio of full load torque to starting torque is _____.

- a 0.3824 b 3.162
 c 0.1203 d 0.5568 [Ans. : b]

Q.84 A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. If voltage between the slip rings on open circuit is 520 V then the torque developed on full load is _____ Nm.

- a 202.52 b 165.523
 c 430.36 d 514.12 [Ans. : a]

Q.85 A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. If voltage between the slip rings on open circuit is 520 V then the maximum torque is _____ Nm.

- a 202.52 b 165.523
 c 430.36 d 514.12 [Ans. : c]

Q.86 A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. If voltage between the slip rings on open circuit is 520 V then the starting torque is _____ Nm.

- a 202.52 b 165.523
 c 430.36 d 514.12 [Ans. : b]

- Q.87** A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. The ratio of full load torque to maximum torque is _____.
- a 0.8174 b 1.2233
 c 0.3846 d 0.4705 [Ans. : d]
- Q.88** A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. The ratio of starting torque to maximum torque is _____.
- a 0.8174 b 1.2233
 c 0.3846 d 0.4705 [Ans. : c]
- Q.89** A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. The ratio of full load torque to maximum torque is _____.
- a 0.8174 b 1.2233
 c 0.3846 d 0.4705 [Ans. : b]
- Q.90** A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. The ratio of maximum torque to full load torque is _____.
- a 0.8174 b 1.2233
 c 0.3846 d 0.4705 [Ans. : a]
- Q.91** A 4 pole, 50 Hz, 3 phase induction motor is running at 1425 r.p.m. on full load having rotor impedance per phase on standstill as $0.4 + j2$ ohms. The external resistance required in the rotor per phase to get maximum torque at start is _____ ohms.
- a 0.2 b 1.6
 c 0.8 d 0.4 [Ans. : b]
- Q.92** A 3 phase induction motor has rotor impedance per phase on standstill as $0.8 + j3.8$ ohms. The external resistance required in the rotor per phase to get maximum torque at start is _____ ohms.
- a 1Ω b 2Ω
 c 3Ω d 4Ω [Ans. : c]
- Q.93** A 3 phase induction motor has rotor impedance per phase on standstill as $0.8 + j3.8$ ohms. Then the maximum torque will occur at slip of _____ %.
- a 21.05 b 20
 c 30 d 35.26 [Ans. : a]
- Q.94** A 3 phase induction motor has rotor impedance on standstill as $0.4 + j2$ ohms. Then the maximum torque will occur at slip of _____ %.
- a 21.05 b 20
 c 30 d 35.26 [Ans. : b]
- Q.95** A 50 Hz, 8 pole, 3 phase induction motor has a full load slip of 4 %. Its rotor impedance per phase on standstill is $0.001 + j0.005$ ohms. Then the maximum torque will occur at slip of _____ %.
- a 21.05 b 20
 c 30 d 35.26 [Ans. : b]
- Q.96** A 50 Hz, 8 pole, 3 phase induction motor has a full load slip of 4 %. Its rotor impedance per phase on standstill is $0.001 + j0.005$ ohms. Then the speed at the maximum torque is _____.
- a 200 b 300
 c 750 d 600 [Ans. : d]
- Q.97** A 50 Hz, 16 pole, 3 phase induction motor has a full load slip of 4 %. Its rotor impedance per phase on standstill is $0.02 + j0.15$ ohms. Then the speed at the maximum torque is _____.
- a 1425 b 375
 c 325 d 625 [Ans. : c]

Q.98 A 50 Hz, 20 pole, 3 phase induction motor has a full load slip of 1.33 %. Its rotor impedance per phase on standstill is $0.02 + j0.3$ ohms. Then the ratio of full load torque to the maximum torque is _____.

- a 0.3846 b 0.5247
 c 0.1327 d 0.8564 [Ans. : a]

Q.99 A 50 Hz, 20 pole, 3 phase induction motor has a full load slip of 1.33 %. Its rotor impedance per phase on standstill is $0.02 + j0.3$ ohms. Then the ratio of starting torque to the maximum torque is _____.

- a 0.3846 b 0.5247
 c 0.1327 d 0.8564 [Ans. : c]

Q.100 The external resistance added in the rotor circuit at start _____.

- a increases the starting torque
 b acts as a starter
 c either (a) or (b)
 d both (a) and (b) [Ans. : d]

Q.101 For getting maximum torque at start _____ is true.

- a rotor resistance is equal to rotor reactance at standstill
 b rotor resistance is less than the rotor reactance at standstill
 c rotor resistance is greater than the rotor reactance at standstill
 d rotor resistance must be zero [Ans. : a]

Q.102 _____ losses are negligible in the rotor circuit in running condition.

- a Copper b Iron
 c Friction d Brush [Ans. : b]

Q.103 The input power of 3 phase induction motor can be measured by _____.

- a multimeter b tachometer
 c one wattmeter method
 d two wattmeter method [Ans. : d]

Q.104 A 3 phase induction motor is running with 4 % slip. Its rotor input is 10 kW then the total rotor copper losses are _____.

- a 1 kW b 4 kW
 c 400 W d 0.04 kW [Ans. : c]

Q.105 A 3 phase induction motor is running with 4 % slip. Its rotor input is 10 kW then the total mechanical power developed is _____.

- a 9.6 kW b 960 W
 c 11.25 kW d 16.6 kW [Ans. : a]

Q.106 A 3 phase induction motor is running with 5 % slip. Its rotor input is 20 kW then the total mechanical power developed is _____.

- a 1.9 kW b 19 kW
 c 15.75 kW d 190 W [Ans. : b]

Q.107 A 3 phase induction motor is running with 5 % slip. Its rotor input is 20 kW then the total rotor copper losses are _____.

- a 0.5 kW b 500 W
 c 10 kW d 1 kW [Ans. : d]

Q.108 A 3 phase induction motor is running with 5 % slip. Its rotor input is 20 kW then the its power output is _____ if frictional losses are 1 kW .

- a 19.75 kW b 1.8 kW
 c 18 kW d 21 kW [Ans. : c]

Q.109 A 3 phase induction motor is running with 5 % slip. Its rotor input is 20 kW and its synchronous speed is 1500 r.p.m. then its shaft torque is _____ if frictional losses are 1 kW .

- a 226.89 Nm b 120.62 Nm
 c 135.487 Nm d 214.78 Nm

[Ans. : b]

Q.110 A 3 phase induction motor is running with 5 % slip. Its rotor input is 20 kW then the its rotor efficiency is _____.

- a 95 % b 65 %
 c 100 % d insufficient data

[Ans. : a]

Q.111 A 3 phase induction motor is running with 5 % slip. Its rotor input is 20 kW then the its overall efficiency is _____.

- a 95 % b 65 %
 c 100 % d insufficient data

[Ans. : d]

Q.112 A 25 kW, 3 phase induction motor is running with 6 % slip. Its rotor copper losses are _____ if frictional losses are 850 W .

- a 1700 b 1650
 c 1550 d 1400 [Ans. : b]

Q.113 A 25 kW, 3 phase induction motor is running with 6 % slip. Its rotor resistance per phase is _____ ohms if frictional losses are 850 W and rotor current per phase is 65 A.

- a 0.3906 b 0.1650
 c 0.1302 d 0.2154 [Ans. : c]

Q.114 A 4 pole, 3 phase induction motor is running with a slip of 4 % producing shaft torque of 300 Nm then its output power is _____ kW.

- a 46.896 b 28.547
 c 52.125 d 45.239 [Ans. : d]

Q.115 For a 3 phase induction motor running at 1440 r.p.m., the torque lost in friction is 50 Nm then its frictional losses are _____ kW.

- a 7.54 b 4.235
 c 6.25 d 8.45 [Ans. : a]

Q.116 A 3 phase induction motor is running with 1455 r.p.m. on full load then its synchronous speed must be _____ r.p.m.

- a 1600 b 1500
 c 2000 d 1000 [Ans. : b]

Q.117 _____ is the cheapest starter.

- a Auto-transformer
 b Stator resistance
 c Star-delta d Rotor resistance

[Ans. : c]

Q.118 The main limitation of the rotor resistance starter is _____.

- a very expensive
 b losses are very high
 c arrangement is complicated
 d suitable only for wound rotor motors

[Ans. : d]

Q.119 The main difficulty in controlling the speed of induction motor by supply frequency is that _____.

- a losses becomes very high
 b efficiency reduces to very low value
 c air gap flux changes causing saturation of rotor core
 d very expensive [Ans. : c]

Q.120 In the electronic scheme of controlling the speed, _____ is kept constant.

- a supply voltage
 b ratio V/f
 c supply frequency f
 d speed [Ans. : b]

Q.121 In the supply voltage speed control of induction motor if supply voltage is reduced then the speed _____.

- a decreases b increases
 c remains same d becomes zero

[Ans. : a]

Q.122 In _____ method of speed control, generally only four different speeds are possible.

- a rotor resistance
 b pole changing
 c V/f control
 d supply voltage control [Ans. : b]

Q.123 A 8 pole, 50 Hz, 3 phase induction motor is running with speed of 725 r.p.m. Its slip is -----.

- a 1 % b 1.33 %
 c 2.33 % d 3.333 %

[Ans. : d]

Q.124 A 16 pole, 50 Hz, 3 phase induction motor is running with speed of 370 r.p.m. Its slip is _____.

- a 1 % b 1.33 %
 c 2.33 % d 3.333 %

[Ans. : b]

Q.125 A 6 pole, 50 Hz, 3 phase induction motor is running with speed of 977 r.p.m. Its slip is _____.

- a 1 % b 1.33 %
 c 2.33 % d 3.333 %

[Ans. : c]

Q.126 A 8 pole, 50 Hz, 3 phase induction motor is running with slip of 3.333 % then its speed is _____ r.p.m.

- a 715 b 725
 c 740 d 775 [Ans. : b]

Q.127 A 16 pole, 50 Hz, 3 phase induction motor is running with slip of 1.333 % then its speed is _____ r.p.m.

- a 315 b 325
 c 370 d 375 [Ans. : c]

Q.128 A 6 pole, 50 Hz, 3 phase induction motor is running with slip of 2.333 % then its speed is _____ r.p.m.

- a 977 b 972
 c 974 d 980 [Ans. : a]

Q.129 A 8 pole, 50 Hz, 3 phase induction motor is running with speed of 727.5 r.p.m. The frequency of the rotor induced e.m.f. is _____ Hz.

- a 1.5 b 2.5
 c 3 d 1 [Ans. : a]

Q.130 A 16 pole, 50 Hz, 3 phase induction motor is running with speed of 356.25 r.p.m. The frequency of the rotor induced e.m.f. is _____ Hz.

- a 1.5 b 2.5
 c 3 d 1 [Ans. : b]

Q.131 A 6 pole, 50 Hz, 3 phase induction motor is running with speed of 940 r.p.m. The frequency of the rotor induced e.m.f. is _____ Hz.

- a 1.5 b 2.5
 c 3 d 1 [Ans. : c]

Q.132 A 4 pole, 50 Hz, 3 phase induction motor is running with speed of 1470 r.p.m. The frequency of the rotor induced e.m.f. is _____ Hz.

- a 1.5 b 2.5
 c 3 d 1 [Ans. : d]

Q.133 _____ denotes rotor impedance of an induction motor in running condition.

- a $R_2 + jX_2$ b $R_2 + \frac{jX_2}{s}$
 c $R_2 + j(1-s)X_2$ d $R_2 + j(sX_2)$
[Ans. : d]

Q.134 _____ denotes rotor impedance of an induction motor in standstill condition.

- a $R_2 + jX_2$ b $R_2 + \frac{jX_2}{s}$
 c $R_2 + j(1-s)X_2$ d $R_2 + j(sX_2)$
[Ans. : a]

Q.135 _____ is the rotor power factor of an induction motor in running condition.

a $\frac{R_2}{\sqrt{R_2^2 + \left(\frac{X_2}{s}\right)^2}}$ b $\frac{R_2}{\sqrt{R_2^2 + (sX_2)^2}}$
 c $\frac{R_2}{\sqrt{R_2^2 + X_2^2}}$ d $\frac{R_2}{\sqrt{R_2^2 + [X_2(1-s)]^2}}$
 [Ans. : b]

Q.136 _____ is the rotor power factor of an induction motor in standstill condition.

a $\frac{R_2}{\sqrt{R_2^2 + \left(\frac{X_2}{s}\right)^2}}$ b $\frac{R_2}{\sqrt{R_2^2 + (sX_2)^2}}$
 c $\frac{R_2}{\sqrt{R_2^2 + X_2^2}}$ d $\frac{R_2}{\sqrt{R_2^2 + [X_2(1-s)]^2}}$
 [Ans. : c]

Q.137 _____ is the rotor current of an induction motor in running condition.

a $\frac{E_2}{\sqrt{R_2^2 + (X_2)^2}}$ b $\frac{sE_2}{\sqrt{R_2^2 + (X_2)^2}}$
 c $\frac{sE_2}{\sqrt{R_2^2 + \left(\frac{X_2}{s}\right)^2}}$ d $\frac{sE_2}{\sqrt{R_2^2 + (sX_2)^2}}$
 [Ans. : d]

Q.138 _____ is the rotor current of an induction motor in standstill condition.

a $\frac{E_2}{\sqrt{R_2^2 + (X_2)^2}}$ b $\frac{sE_2}{\sqrt{R_2^2 + (X_2)^2}}$
 c $\frac{sE_2}{\sqrt{R_2^2 + \left(\frac{X_2}{s}\right)^2}}$ d $\frac{sE_2}{\sqrt{R_2^2 + (sX_2)^2}}$
 [Ans. : a]

Q.139 For a 3 phase induction motor, ratio of stator to rotor turns is 2 while supply voltage is 415 V then rotor induced e.m.f. per phase on standstill is _____ V.

a 207.5 b 119.8
 c 830 d 479.2 [Ans. : b]

Q.140 The condition for maximum torque in a 3 phase induction motor is _____.

a $s = R_2 X_2$ b $s = \frac{R_2}{X_2}$
 c $s = \frac{R_2}{(1-s)X_2}$ d $sR_2 = X_2$
 [Ans. : b]

Q.141 The magnitude of the maximum torque in a 3 phase induction motor is _____.

a $\frac{K s E_2^2}{2 X_2}$ b $\frac{K (1-s) E_2^2}{2 X_2}$
 c $\frac{K E_2^2}{2 s X_2}$ d $\frac{K E_2^2}{2 X_2}$
 [Ans. : d]

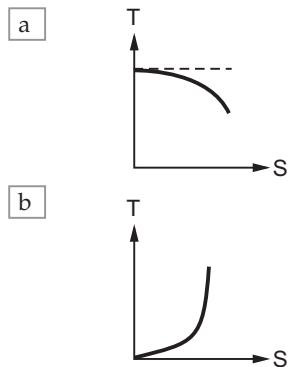
Q.142 The expression for the starting torque of a 3 phase induction motor is _____.

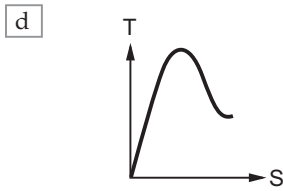
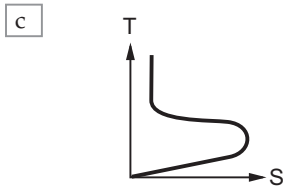
a $\frac{K E_2^2 R_2}{R_2^2 + X_2^2}$ b $\frac{K s E_2^2 R_2}{R_2^2 + X_2^2}$
 c $\frac{K s E_2^2 R_2}{R_2^2 + (sX_2)^2}$ d $\frac{K E_2^2 R_2}{R_2^2 + (sX_2)^2}$
 [Ans. : a]

Q.143 The general torque equation of a 3 phase induction motor is _____.

a $\frac{K E_2^2 R_2}{R_2^2 + X_2^2}$ b $\frac{K s E_2^2 R_2}{R_2^2 + X_2^2}$
 c $\frac{K s E_2^2 R_2}{R_2^2 + (sX_2)^2}$ d $\frac{K E_2^2 R_2}{R_2^2 + (sX_2)^2}$
 [Ans. : c]

Q.144 _____ represents torque-slip characteristics of 3 phase induction motor.





[Ans. : d]

Q.145 The ratio of full load torque to maximum torque is ____ if $a = \frac{R_2}{X_2}$ and $s_f =$ Full load slip.

a $\frac{2 s_f}{a^2 + s_f^2}$ b $\frac{2 a s_f}{a^2 + s_f^2}$

c $\frac{2 a}{1 + a^2}$ d $\frac{2 s_f}{1 + a^2}$ [Ans. : b]

Q.146 The ratio of starting torque to maximum torque is ____ if $a = \frac{R_2}{X_2}$ and $s_f =$ Full load slip.

a $\frac{2 s_f}{a^2 + s_f^2}$ b $\frac{2 a s_f}{a^2 + s_f^2}$

c $\frac{2 a}{1 + a^2}$ d $\frac{2 s_f}{1 + a^2}$ [Ans. : c]

Q.147 The input power of induction motor is given by ____.

a $\sqrt{3} V_L I_{ph} \cos \phi$ b $\sqrt{3} V_L I_L$

c $\sqrt{3} V_L I_L \cos \phi$ d $V_L I_L \cos(30 + \phi)$ [Ans. : c]

Q.148 The rotor copper losses of induction motor are ____.

a $3 I_{2r}^2 R_2$ b $\frac{3 I_{2r}^2}{R_2}$

c $3 I_{2r}^2 \sqrt{R_2^2 + X_2^2}$ d $3 I_{2r}^2 \sqrt{R_2^2 + (sX_2)^2}$ [Ans. : a]

Q.149 For an induction motor, the rotor efficiency is ____.

a $\frac{P_2}{P_m}$ b $\frac{P_2}{P_{in}}$

c $\frac{P_m}{P_2}$ d $\frac{P_{out}}{P_{in}}$ [Ans. : c]

Q.150 The net efficiency of an induction motor is ____.

a $\frac{P_2}{P_m}$ b $\frac{P_2}{P_{in}}$

c $\frac{P_m}{P_2}$ d $\frac{P_{out}}{P_{in}}$ [Ans. : d]

Q.151 For an induction motor, $\frac{P_2}{P_c} =$ ____.

a s b $\frac{1}{s}$

c $\frac{1}{1-s}$ d $\frac{s}{1-s}$ [Ans. : b]

Q.152 For an induction motor, $\frac{P_c}{P_m} =$ ____.

a s b $\frac{1}{s}$

c $\frac{1}{1-s}$ d $\frac{s}{1-s}$ [Ans. : d]

Q.153 For an induction motor, $\frac{P_2}{P_m} =$ ____.

a s b $\frac{1}{s}$

c $\frac{1}{1-s}$ d $\frac{s}{1-s}$ [Ans. : c]

Q.154 ____ starter reduces the starting current by the factor $\frac{1}{\sqrt{3}}$.

a Stator resistance

b Star-delta c Autotransformer

d Direct on line [Ans. : b]

Q.155 ____ starter is used for the motor below 5 H.P. rating.

a Stator resistance

b Star-delta c Autotransformer

d Direct on line [Ans. : d]

Q.156 The starter shown in the Fig. 6.1 is ____ starter.

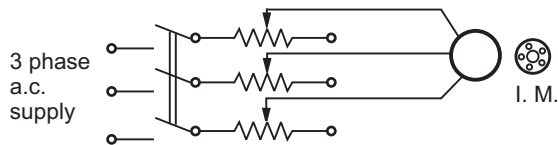


Fig. 6.1

- a stator resistance
- b rotor resistance
- c direct on line
- d autotransformer

[Ans. : a]

Q.157 The starter shown in the Fig. 6.2 is ____ starter.

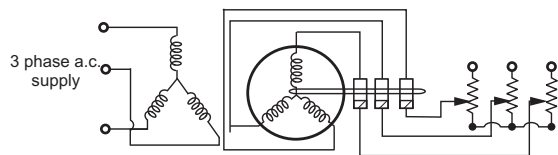


Fig. 6.2

- a stator resistance
- b rotor resistance
- c direct on line
- d autotransformer

[Ans. : b]

