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Objective Solved
Questions

Volume-2

Electrical Machine

MCOQ

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This book has been organized and executed with a lot of care, dedication and passion for lucidity. A conscious attempt has been made to simplify the concepts to facilitate better understanding of the subject.

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We would feel satisfied if the book meets the needs of the students for whom it is meant.

Lastly, we are thankful to all the engineers, authors whose work has been the source of enlightenment, inspiration and guidance in presenting this book.

It is hoped that the book in its new form will enjoy its ever increasing popularity.

Regards

Dr. Pankaj Goyal



Preface

This book has been written to meet the growing requirements of candidates appearing for BSNL, DRDO, ISRO, BARC, ECIL, TTA, RRB-JE, State and Public Sector Engineering Examinations. Though every candidate has ability to succeed but competitive environment, in-depth knowledge, quality guidance, time management and good source of study is required to achieve goals.

This book includes Multiple Choice Questions (MCQ) which works as a mock exam practice for the reader. Questions of all the subject have been organized in systematic, concepts oriented and error less manner so that it become easy and interesting for even a beginner to understand. It is a very convenient book and must be solved by candidate aiming for competitive exams.

After solving this booklet students can feel encouraged and develop confidence to attempt each and every type of numerical as well as theoretical problems. Each problems explains solving approach so that at the end, so the reader is well equipped to be able to apply any type of problem solving requirement and distinctly choose one strategy or type from the other.

We hope this book will be proved an important tool to succeed in BSNL, DRDO, ISRO, BARC, ECIL, TTA, RRB-JE, State and Public Sector Engineering Examinations.

It is earnestly hoped that with the extensive additions and revisions, the present edition will facilitate the students not only in preparing themselves for competitive examinations but also in preparing for their regular examinations and prove more useful to the students than the earlier editions.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor types in the book. If any such types found, they will be highly appreciated and in incorporated in the next edition. Also, please provide your valuable suggestions at : engineers.academy.india@gmail.com

Wish you all the best. Have a nice reading.

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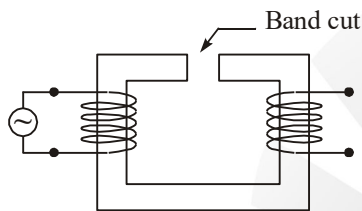
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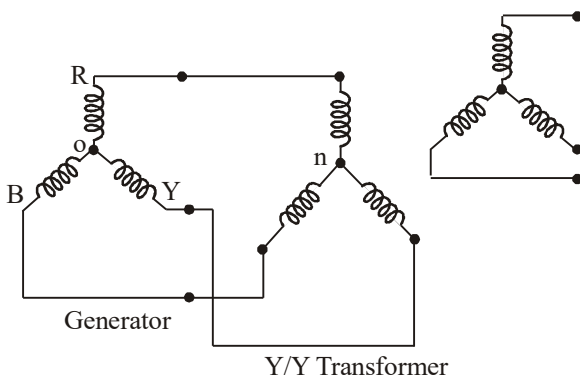
TRANSFORMER

OBJECTIVE QUESTIONS

1. If a saw-cut is made in the iron core of a single-phase transformer as shown in the given figure, with secondary terminals open it will result in



- (a) No voltage across secondary terminals due to discontinuity in magnetic circuit
 (b) Excessive large current drawn by primary
 (c) No appreciable change in the operation of the transformer
 (d) No transformer action and the primary current will be greatly reduced
2. A star-connected generator supplies power to a star/star connected transformer as shown in the given figure. The generator voltages are perfectly balanced. As a result,



- (a) Third harmonic exciting currents will flow in the primaries of star
 (b) Third harmonic exciting currents cannot flow in the primaries of star
 (c) The fluxes in the three transformer cores are sinusoidal in time
 (d) The voltage between '0' and 'n' is zero
3. In a 3-phase power transformer, 5-limbed construction is adopted to
- (a) Suppress the 5th and 7th harmonics
 (b) Suppress the 3rd and its multiple harmonics
 (c) Suppress all the orders of harmonics
 (d) Increase the capacity of the transformer
4. Consider the following statements:
 The use of Delta-connected tertiary windings in star-star connected power transformers

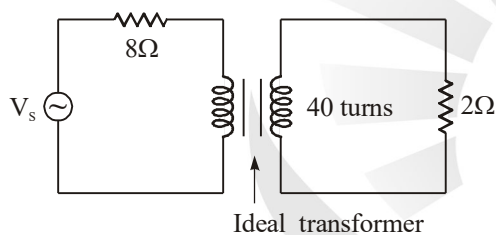
- Makes available supply for single-phase loads.
- Suppresses harmonic voltages.
- Allows flow of earth fault current for operation of protective devices
- Provides low-reactance paths for zero-sequence currents.

Of the statements are correct:

- (a) 1, 2 and 3 are correct
 (b) 1, 3 and 4 are correct
 (c) 2 and 4 are correct
 (d) 1, 2, 3 and 4 are correct

5. If the height to width ratio of the window of core-type transformer is increased, then
- Its leakage reactance and percentage voltage regulation will decrease
 - Its leakage reactance will decrease and percentage voltage regulation will increase
 - Its leakage reactance will be unaffected but total space in the window will increase to accommodate the windings better
 - Efficiency will increase and temperature rise will decrease

6. If the secondary winding of the ideal transformer of the circuit shown in the given figure has 40 turns, then for maximum power transfer to the 2-ohm resistor, the number of turns required in the primary winding will be



- 20
- 40
- 80
- 120

7. A 220/110V, 50 Hz single-phase transformer having a negligible winding resistances operates from a variable voltage, variable frequency supply such that V_1/f ($V_1 =$ primary applied voltage, voltage, $f =$ source frequency) is constant. This will bring the given range of frequencies,

- Variation in both eddy current loss and hysteresis loss
- Variation only in the eddy current loss, hysteresis loss remaining constant
- Variation only in the hysteresis loss, eddy current loss remaining constant
- No change either in the eddy current loss or the hysteresis loss

8. A 3-phase Y/ Δ transformer has per phase turn ratio 'K' and line voltage ratio K_1 . If the voltage of Δ winding lags the voltage of Y winding by an angle ϕ then K , K_1 and ϕ are related as

- $K_1 = K$ and $\phi = -30^\circ$
- $K_1 = \frac{K}{\sqrt{3}}$ and $\phi = -30^\circ$
- $K_1 = \sqrt{3}K$ and $\phi = -30^\circ$
- $K_1 = K$ and $\phi = 30^\circ$

9.

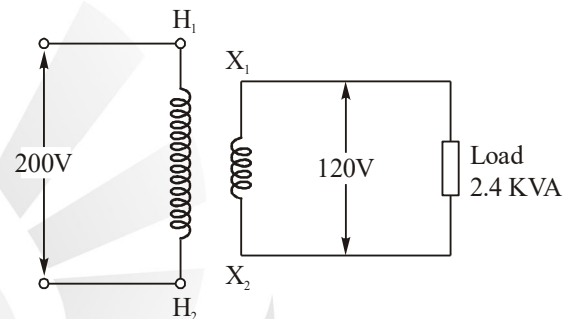


Figure I

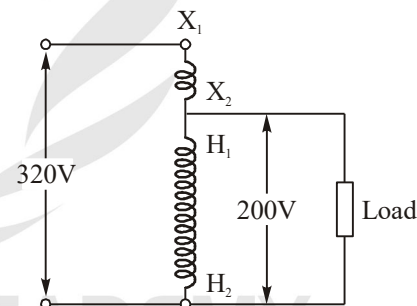
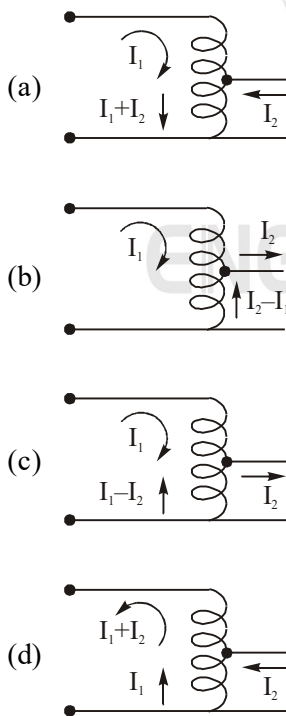


Figure II

A two-winding transformer (200 V/120 V) has a load of 2.4 kVA as shown in Figure-1. The windings of transformers are reconnected as an auto transformer shown in Figure- II. Assuming the same current rating for both the windings as before and neglecting the losses, the kVA rating of the auto transformer will be

- 6.4 kVA
- 4.0 kVA
- 3.84 kVA
- 2.4 kVA

10. Two transformers X and Y with identical ratings and dimensions have 0.8 mm and 1.2 mm thick laminations respectively. If R_m and X_m are the magnetizing branch parameters in the equivalent circuit, then
- R_m values in both are likely to be equal, but X_m of X is likely to be higher than X_m of Y
 - X_m values in both are likely to be equal, but R_m of X is likely to be higher than R_m of Y
 - X_m values in both are likely to be equal, but R_m of X is likely to be lower than R_m of Y
 - R_m values in both are likely to be equal, but X_m of X is likely to be lower than X_m of Y
11. Hysteresis loss of a transformer designed at voltage 'V' and frequency 'f' is P_h . If the transformer is operated from a voltage 'xV' and frequency 'xf' the hysteresis loss for a Steinmetz constant of will be
- x^2P_h
 - xP_h
 - P_h
 - x^3P_h
12. Which one of the following figures represents the correct direction of flow of currents in the different sections of the windings of an auto transformer ?



13. Two magnetic materials. A and B have their electrical conductivities in the ratio 4 : 9. Eddy current losses in the materials A and B are in the ratio
- 2 : 3
 - 3 : 2
 - 9 : 4
 - 4 : 9
14. For a distribution sub-station power transformer, operating at normal voltage and frequency, and with usual 24-hour urban domestic load-cycle, let the commercial efficiency be η_c and the all-day efficiency be η_a . Under the operating conditions stated above, which one of the following is correct?
- $\eta_c = \eta_a$
 - $\eta_c > \eta_a$
 - $\eta_c < \eta_a$
 - η_c and η_a can not be compared, as they have different units
15. Consider the following statements concerning the ferromagnetic materials :
- There are easy and hard magnetization directions in the ferromagnetic Crystal.
 - Eddy current losses are smaller for materials having low electrical conductivity values.
 - All ferromagnetic materials can be used at high frequencies.
- Which of the statements given above are correct?
- 1, 2 and 3
 - 1 and 2
 - 2 and 3
 - 1 and 3
16. Two transformers with identical voltage ratings are working in parallel to supply a common load. The percentage impedance of one transformer higher compared to that of the other. The load sharing between the two transformers will
- Be proportionate to their percentage impedances
 - Be independent of their percentage impedances
 - Be inversely proportional to their respective impedances
 - Depend on the resistance to Leakage reactance ratio of each transformer

17. Consider the following statements:

In a transformer, an iron core is used to

1. Increase the useful flux.
2. Reduce the leakage flux.
3. Reduce the useful flux.

Which of the above is/are correct?

- (a) 2 only (b) 1 and 2
(c) 2 and 3 (d) 3 only

18. Three single-phase transformers, each of 100 kVA rating are connected in delta, if one of the transformers is taken out of service, the capacity of the system will be

- (a) 200 kVA (b) 173.2 kVA
(c) 115.5 kVA (d) 36.6 kVA

19. Three units of 1 : 5 transformers are connected in Δ -Y to supply a 3-phase load from a 400 V 3-phase source. The line voltage on the load side is

- (a) 1000V (b) 80V
(c) 3464 V (d) 803 V

20. A 15 MVA, 33/11 kV, 3-phase transformer having an impedance of 16Ω on the high tension side is supplied from a generator rated 30 MVA, 11 kV. The p.u. impedance of the transformer calculated on its own base and on the generator base will be in the ratio

- (a) 1 : 1 (b) 1 : 3
(c) 1 : 9 (d) 1 : 18

21. The full-load, copper loss of a transformer is twice its core loss. At what percent of the full-load, will the efficiency be maximum?

- (a) 25% (b) 50%
(c) 70.7% (d) 141 %

22.

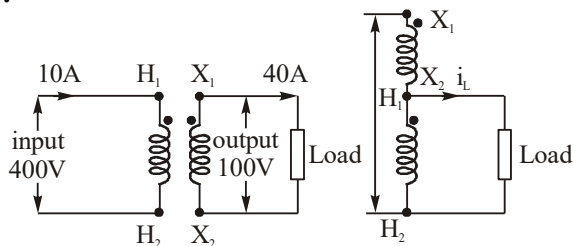


Fig. 1

Fig. 2

The above diagrams show a two-winding transformer (Fig. 1) and an auto transformer (Fig. 2) formed by reconnection of the terminals of the former. The terminal markings are the conventional-ones with regard to the respective polarities. When operated as an auto-transformer with an input voltage of 500V the output load current would be

- (a) 50 A (b) 40 A
(c) 30 A (d) 10 A

23. Three single-phase transformers with turn ratio 1:10 are connected in delta-star to supply a 3-phase load. The supply voltage is 400 V (line to line). The line voltage on the load side is

- (a) 400V (b) $400\sqrt{3}$ V
(c) 4000V (d) $4000\sqrt{3}$ V

24. Which of the following statements are incorrect?

1. Maximum voltage regulation of transformer occurs at leading power factor.
2. Voltage regulation of a transformer is the maximum when load power factor (lagging) angle has the same value as the angle of equivalent impedance
3. Voltage regulation of a transformer at leading power factor is always zero.
4. Voltage regulation of a transformer can be negative at leading power factor.

Select the correct answer using the codes given below:

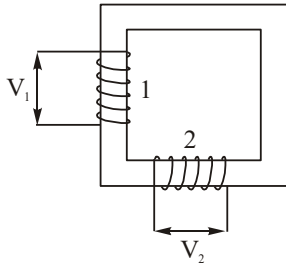
- (a) 1 and 3 (b) 2 and 3
(c) 2 and 4 (d) 1 and 4

25. Two 3-phase transformers are connected to the same supply of balanced 3-phase voltages on the primary side. The first transformer is connected in Yd1 on the second in Dy11. The phase difference between the line-to-line voltages of the corresponding phases on the secondary sides of the two transformers of

- (a) 0° (b) 30°
(c) 60° (d) 90°

26. The given figure represents a transformer with two windings 1 and 2 wound on the core as shown. By applying a voltage V_1 across winding

1. A voltage V_2 induced across winding
2. In an idealized condition V_2 would lag V_1 by



- (a) Zero degrees (b) 90 degrees
(c) 180 degrees (d) 270 degrees

27. The leakage flux in a transformer depends upon the

- (a) Applied voltage (b) Frequency
(c) Load current (d) Mutual flux

28. The voltage regulation of a large transformer is mainly influenced by

- (a) No-load current and load power factor
(b) Winding resistances and load power factor
(c) Leakage fluxes and load power factor
(d) Winding resistances and core loss

29. The series equivalent impedance of a single phase transformer referred to its secondary side is $Z_{e_2} = R_{e_2} + jX_{e_2}$. The voltage regulation of this transformer will be zero when the power factor of the load is

- (a) Unity (b) $\left| \frac{X_{e_2}}{Z_{e_2}} \right|$ leading
(c) $\left| \frac{X_{e_2}}{Z_{e_2}} \right|$ lagging (d) $\left| \frac{R_{e_2}}{Z_{e_2}} \right|$ leading

30. A bank of three identical single-phase 250 kVA, 11 kV/230 V transformers is used to provide 400 V low tension supply from a 11 kV, 3-phase sub-station. The effective kVA rating of the bank will be

- (a) 250 (b) $250\sqrt{3}$
(c) 500 (d) 750

31. A transformer designed for operation on 60 Hz supply is worked on 50 Hz supply system without changing its voltage and current ratings. When compared with full load efficiency at 60 Hz, the transformer efficiency on full load at 50 Hz will

- (a) Increase marginally
(b) Increase by a factor of 1.2
(c) Remain unaltered
(d) Decrease marginally

32. A transformer has a core loss of 200W and a full load copper loss of 800W. The maximum efficiency of the transformer will occur at

- (a) 0.5 times full load current
(b) 0.6 times full load current
(c) 0.7 times full load current
(d) 0.8 times full load current

33. In a transformer P_i is iron loss at rated voltage and P_c is full load copper loss. If the maximum efficiency occurs at 75% of full load, then which one of the following is correct?

- (a) $P_i = P_c$ (b) $\frac{3}{4}P_i = P_c$
(c) $P_i = \frac{9}{16}P_c$ (d) $P_i = \frac{16}{9}P_c$

34. An open circuit test was done on a transformer with rated voltage at rated frequency. If the open circuit test is now done on the transformer with double the rated voltage with double the rated frequency, then which one of the following is correct ?

- (a) Both current and power factor increase
(b) Both current and power factor decrease
(c) Current decreases but power factor increases
(d) Current increases but power factor decreases

35. The main purpose of the conservator in a (Driving system) transformer is to

- (a) Store extra oil to compensate for the loss of oil due to leakage
(b) Achieve better cooling of the transformer
(c) Take up the expansion of oil due to heating
(d) Have the Bucholtz relay fitted

36. Which one of the following can be obtained by the equivalent circuit of an electrical machine?
- Temperature rise in the cores
 - Complete performance characteristic of the machine
 - Type of protection used in the machine
 - Design parameters of the windings
37. Which one of the following statements regarding a transformer is correct?
- In transformers, a laminated core is used to reduce copper losses
 - Core losses in a transformer can be determined by open-circuit test
 - Short-circuit test is conducted on a transformer to determine constant losses
 - In a shell type transformer the primary and secondary windings are wound on separate limbs
38. A 300 kVA transformer has 95% efficiency at full load, 0.8 pf lagging and 96% efficiency at half load, unity pf. The iron loss W_i and copper loss W_{cu} in kW, under full-load operation are
- 4.12, 8.51
 - 6.59, 9.21
 - 8.51, 4.12
 - 12.72, 307
39. A single-phase transformer has a maximum efficiency of 90% at full load and unity power factor. Efficiency at half load at the same power factor is
- 87.7%
 - 88.26%
 - 95%
 - 96%
40. The percentage resistance and percentage reactance of a 10 kVA, 400 V/200 V, single-phase transformer are 3% and 6%. The transformer is supplying a current of 50 A to a resistive load. The value of the voltage across the load is
- 194 V
 - 198 V
 - 192 V
 - 196 V
41. The efficiency of a 100 kVA transformer is 0.98 at full as well as at half load. For this transformer at full load, the copper loss
- Is less than core loss
 - Is equal to core loss
 - Is more than core loss
 - None of the above
42. The low-voltage winding of a 400 V/230 V, 1 phase, 50 Hz transformer is to be connected to a 25 Hz supply. In order to keep the magnetisation current at the same level as that for normal 50 Hz supply, at 25 Hz supply the supply voltage should be
- 230 V
 - 460 V
 - 115 V
 - 65 V
43. A voltage $V = 400 \sin 314.16t$ is applied to a 1-phase transformer on no-load. If the no-load current of the transformer is $2 \sin (314.16 t - 85^\circ)$, the magnetisation branch impedance will be approximately equal to
- $141 \angle 90^\circ$
 - $200 \angle -85^\circ$
 - $200 \angle 85^\circ$
 - $282 \angle -80^\circ$
44. The equivalent resistance of the primary of a transformer having $K = 5$ and $R_1 = 0.1 \Omega$, when referred to secondary becomes ohms
- 0.5
 - 0.02
 - 0.004
 - 2.5

[TNPSC AE - 2018]

45. It is desired to measure parameters of 230 V/115 V, 2 kVA single-phase transformer. The following wattmeters are available in a laboratory:
- W_1 : 250 V, 10 A, Low power factor
 W_2 : 250 V, 5 A, Low power factor
 W_3 : 150, 10 A, High power factor
 W_4 : 150 V, 5 A, High power factor
- The wattmeters used in open-circuit test and short-circuit test of the transformer will respectively be
- W_1 and W_2
 - W_2 and W_4
 - W_1 and W_4
 - W_2 and W_3

46. In transformers, which of the following statements is valid?
- (a) In an open circuit test, copper losses are obtained while in a short-circuit test, core losses are obtained.
 - (b) In an open-circuit test, current is drawn at higher power factor.
 - (c) In a short-circuit test, current is drawn at zero power factor.
 - (d) In an open-circuit test, current is drawn at low power factor.
47. The full-load copper loss of a transformer is twice its core loss. The efficiency will be maximum at
- (a) 25% of full load
 - (b) 50% of full load
 - (c) 70.7% of full load
 - (d) 141% of full load
48. A transformer has a reactance of 0.1 p.u. and negligible resistance. Its voltage regulation at full load and 0.8 power factor lagging is
- (a) 8% (b) 6%
 - (c) -6% (d) -8%
49. A transformer has a resistance of 2% and a reactance of 4%. Its regulation at 0.8 pf lagging and leading respectively are
- (a) 4% and -0.8% (b) -4% and 0.8%
 - (c) -0.8% and 4% (d) -0.8% and -4%
50. The full-load copper loss and iron loss of a transformer are 6400 W and 5000 W respectively. The copper loss and iron loss at half load will be respectively
- (a) 3200 W and 2500 W
 - (b) 3200 W and 5200 W
 - (c) 1600 W and 1250 W
 - (d) 1600 W and 5000 W
51. In a 100 kVA (1100/220) V, 50 Hz, single-phase transformer with 2000 turns on the high-voltage side, the open-circuit result gives 220 V, 91 A, 5 kW on the low-voltage side. The core-loss component of the current is approximately
- (a) 9.1 A (b) 22.7 A
 - (c) 45 A (d) 91 A
52. The load at which maximum efficiency occurs in case of a 100 kVA transformer with iron loss of 1 kW and full load copper loss of 2 kW is
- (a) 100 kVA (b) 70.7 kVA
 - (c) 50.5 kVA (d) 25.2 kVA
53. The eddy current losses in a transformer is reduced
- (a) If lamination is not done
 - (b) If the number of turns in primary winding is reduced
 - (c) If the number of turns in secondary winding is reduced
 - (d) If lamination is done
54. When the primary of a transformer is connected to a dc supply,
- (a) Primary draws small current
 - (b) Primary leakage reactance is increased
 - (c) Core losses are increased
 - (d) Primary may burn out
55. The efficiency of transformer will be maximum when
- (a) Leakage reactances of the two windings are equal
 - (b) Resistances of the two windings are equal
 - (c) Copper loss is equal to constant loss
 - (d) None of the above
56. The efficiency of a transformer is usually in the range of
- (a) 50 to 60% (b) 60 to 80%
 - (c) 80 to 90% (d) 90 to 98%

57. In a transformer, the primary and the secondary voltages are
(a) 60° out of phase (b) 90° out of phase
(c) 180° out of phase (d) Always in phase
58. The dielectric strength of transformer oil is expected to be
(a) 1 kV (b) 33 kV
(c) 100 kV (d) 330 kV
59. In the transformer following winding has got more cross-sectional area
(a) Low voltage winding
(b) High voltage winding
(c) Primary winding
(d) Secondary winding
60. A transformer cannot raise or lower the voltage of a D.C. supply because
(a) There is no need to change the D.C. voltage
(b) A D.C. circuit has more losses
(c) Faraday's laws of electromagnetic induction are not valid since the rate of change of flux is zero
(d) None of the above
61. Spacers are provided between adjacent coils
(a) To provide free passage to the cooling oil
(b) To insulate the coils from each other
(c) Both (a) and (b)
(d) None of the above
62. If R_2 is the resistance of secondary winding of the transformer and K is the transformation ratio then the equivalent secondary resistance referred to primary will be
(a) $\frac{R_2}{\sqrt{K}}$ (b) $\frac{R_2}{K^2}$
(c) $\frac{R_2^2}{K^2}$ (d) $\frac{R_2^2}{K}$
63. The use of higher flux density in the transformer design
(a) Reduces weight per kVA
(b) Reduces iron losses
(c) Reduces copper losses
(d) Increase part load efficiency
64. The chemical used in breather is
(a) Asbestos fibre
(b) Silica sand
(c) Sodium chloride
(d) Silica gel
65. Star/star transformers work satisfactorily when
(a) Load is unbalanced only
(b) Load is balanced only
(c) On balanced as well as unbalanced loads
(d) None of the above
66. During open circuit test of a transformer
(a) Primary is supplied rated voltage
(b) Primary is supplied full-load current
(c) Primary is supplied current at reduced voltage
(d) Primary is supplied rated kVA
67. The size of a transformer core will depend on
(a) Frequency
(b) Area of the core
(c) Flux density of the core material
(d) Both (a) and (c)
68. Minimum voltage regulation occurs in transformer when the power factor of the load is
(a) Unity (b) Lagging
(c) Leading (d) Zero
69. A pole pitch in electrical machine is:
(a) Equal to 180° electrical
(b) Equal to 180° mechanical
(c) Less than 180° electrical
(d) Greater than 180° electrical

70. Which of the following are constant losses in Transformers?
- (a) Winding losses
 - (b) Core losses
 - (c) Both Winding & core losses
 - (d) None of these
- [DMRC JE-2016]**
71. Two transformers with identical voltage ratings are working in parallel to supply common load. The percentage impedance of one transformer is higher compared to that of other. The load sharing between the two transformer will:
- (a) Be proportional to their percentage impedance
 - (b) Be independent of their percentage impedance
 - (c) Be inversely proportional to their respective impedance
 - (d) Depend on the resistance to leakage reactance ratio of each transformer
- [DMRC JE-2016]**
72. When two transformer of different kVA rating are connected in parallel they share the load in proportion to their respective kVA rating only when their:
- (a) kVA rating are identical
 - (b) Efficiencies are equal
 - (c) pu impedance are equal
 - (d) Equivalent impedance are equal
- [DMRC JE-2016]**
73. Hysteresis loss in a transformer depends upon:
- (a) Frequency
 - (b) Supply voltage
 - (c) Square of the frequency alone
 - (d) Square of the voltage alone
- [DMRC JE-2016]**
74. Which of the following is determined by the turns ratio?
- (a) Ratio of primary and secondary voltages
 - (b) Ratio of primary and secondary currents
 - (c) Both (a) and (b)
 - (d) None of these
75. The turns ratio of a step down transformer is
- (a) equal to one
 - (b) less than 1
 - (c) more than 1
 - (d) more than that of the step-up transformer
76. Which of the following is true with a transformer?
- (a) The same transformer can be used as a step up or step down.
 - (b) The primary winding and the secondary winding are connected through a central tap.
 - (c) Both (a) and (b)
 - (d) None of these.
77. Which of the following is true with transformers?
- (a) They work on the principle of induction.
 - (b) The voltage can be either stepped-up or stepped down.
 - (c) Both (a) and (b)
 - (d) None of these.
78. What is the secondary power of a transformer having a 2:1 voltage ratio, if the primary power is 200 W?
- (a) 400 W
 - (b) 100 W
 - (c) 200 W
 - (d) None of these
79. A transformer with 1:1 turns ratio is called.
- (a) Isolation transformer
 - (b) Equitable transformer
 - (c) Isotopic transformer
 - (d) None of these
80. Which of the following is true in a Y-Y configuration?
- (a) The phase current, line current and load current are equal in each phase.
 - (b) The phase current and line current are equal and load current is double of line current.
 - (c) The phase current double of line current but, load current and line current are equal.
 - (d) None of these.

81. Which of the following statements is true about the windings of a transformer?
- (a) Windings are conductively linked
 (b) Windings are inductively linked.
 (c) Windings are not linked at all
 (d) Windings are electrically linked.
- [UPPCL JE - 2014]
82. Five limb core construction is preferred over three limb construction because is this type of construction:
- (a) Hysteresis loss is reduced
 (b) Eddy current loss is reduced
 (c) Magnetic reluctance of the three phases can be balanced
 (d) Copper losses can be reduced
- [RRB SSE - 2015]
83. The principle of mutual induction is applied in case of
- (a) Alternator (b) Synchronous motor
 (c) Wattmeter (d) Transformer
- [UPPCL JE - 2014]
84. Which of the following is not a type of construction used for single phase transformer?
- (a) Core type (b) Shell type
 (c) Berry type (d) Roof type
- [UPPCL JE - 2014]
85. If in a transformer, ' P_m ' denotes the maximum value of the flux, ' f ' is the frequency of the supply voltage, ' N_1 ' is number of primary winding turns, ' E_1 ' is RMS value of the primary induced emf, then one of the equations of the transformer would be:
- (a) $E_1 = 4.44 f P_m N_1$ (b) $E_1 = 2.35 f P_m N_1$
 (c) $E_1 = 1.23 f P_m N_1$ (d) $E_1 = 7.8 f P_m N_1$
- [UPPCL JE - 2014]
86. An ideal transformer has ____.
- (a) Very high losses (b) Very low losses
 (c) Moderate losses (d) No losses
- [UPPCL JE - 2014]
87. The no-load current of a transformer is 20A at a power factor of 0.20 lagging, when connected to 400 V, 50 Hz supply. Calculate the magnetizing component of no-load current.
- (a) 13.4 A (b) 16.8 A
 (c) 19.6 A (d) 18.2 A
- [UPPCL JE - 2014]
88. Which of the following statement/s is/are true?
- I. DC supply cannot be used for transformers.
 II. The transformer works on the principle of mutual induction.
- Choose the correct answer from the options given below.
- (a) Only I (b) Both I and II
 (c) Only II (d) Neither I nor II
- [UPPCL JE - 2014]
89. On which of the following do the eddy current losses depend?
- I. Nature of the material
 II. Maximum flux density
 III. Frequency
- Choose the correct answer from the options given below.
- (a) I, II and III (b) II and III
 (c) I and II (d) I and III
- [UPPCL JE - 2014]
90. Hysteresis loss is _____ proportional to the area under the hysteresis curve. Also, it is _____ proportional to the number of cycles of magnetization per second.
- (a) Directly, inversely (b) inversely, directly
 (c) directly, directly (d) inversely, inversely
- [UPPCL JE - 2014]
91. A 2000/200 V, 20 kVA transformer has 66 turns in the secondary. The number of primary turns are:
- (a) 660 (b) 440
 (c) 770 (d) 330
- [NMRC JE-2017]

ANSWERS SHEET

1. *Ans. (b)* 38. *Ans. (a)* 70. *Ans. (b)*
 2. *Ans. (b)* 39. *Ans. (a)* 71. *Ans. (c)*
 3. *Ans. (a)* 40. *Ans. (a)* 72. *Ans. (c)*
 4. *Ans. (d)* 41. *Ans. (c)* 73. *Ans. (a)*
 5. *Ans. (a)* 42. *Ans. (c)* 74. *Ans. (c)*
 6. *Ans. (c)* 43. *Ans. (c)* 75. *Ans. (c)*
 7. *Ans. (a)* 44. *Ans. (d)* 76. *Ans. (a)*
 8. *Ans. (c)* $R'_1 = K^2 R_1$ 77. *Ans. (c)*
 9. *Ans. (a)* $= (5)^2 \times 0.1$ 78. *Ans. (c)*
 10. *Ans. (b)* $= 2.5 \Omega$ Power is given as
 11. *Ans. (b)* 45. *Ans. (d)* $P = VI,$
 12. *Ans. (b)* 46. *Ans. (d)* for the given question, the voltage in secondary
 13. *Ans. (d)* 47. *Ans. (c)* coil will get halved while current will be doubled
 14. *Ans. (b)* 48. *Ans. (b)* so power will be same.
 15. *Ans. (b)* 49. *Ans. (a)* 79. *Ans. (a)*
 16. *Ans. (c)* 50. *Ans. (d)* 80. *Ans. (a)*
 17. *Ans. (b)* 51. *Ans. (b)* 81. *Ans. (b)©I3*
 18. *Ans. (b)* 52. *Ans. (b)* Transformer works on mutual induction principle
 19. *Ans. (c)* 53. *Ans. (d)* so, the windings are inductively linked.
 20. *Ans. (d)* 54. *Ans. (d)* 82. *Ans. (c)*
 21. *Ans. (c)* 55. *Ans. (c)* 83. *Ans. (d)*
 22. *Ans. (a)* 56. *Ans. (d)* 84. *Ans. (d)*
 23. *Ans. (d)* 57. *Ans. (c)* 85. *Ans. (a)*
 24. *Ans. (a)* 58. *Ans. (b)* $E_1 = 4.44 f \phi_m N$
 25. *Ans. (c)* 59. *Ans. (a)* So, $E_1 = 4.44 f P_M N_1$
 26. *Ans. (c)* 60. *Ans. (c)* 86. *Ans. (d)*
 27. *Ans. (c)* 61. *Ans. (a)* 87. *Ans. (c)*
 28. *Ans. (c)* 62. *Ans. (b)* Magnetizing Current
 29. *Ans. (b)* 63. *Ans. (a)* $I_m = I_0 \sin \phi$
 30. *Ans. (d)* 64. *Ans. (d)* $\phi = \cos^{-1}(0.2) = 78.46^\circ$
 31. *Ans. (d)* 65. *Ans. (b)* $I_m = 20 \times \sin(78.46) = 19.6 \text{ A}$
 32. *Ans. (a)* 66. *Ans. (a)* 88. *Ans. (b)*
 33. *Ans. (c)* 67. *Ans. (d)* 89. *Ans. (a)*
 34. *Ans. (d)* 68. *Ans. (c)* Eddy current power loss in a magnetic material
 35. *Ans. (c)* 69. *Ans. (a)* is given by

$$P_e = K_e B_m^2 t^2 f^2 \text{ Watts}$$

Where

$K_e \rightarrow$ Coefficient of eddy current,
its value depends upon the
nature of material.

$B_m \rightarrow$ Maximum flux density

$f \rightarrow$ frequency

$$x = \sqrt{\frac{P_i}{P_c}}$$

$$\frac{3}{4} = \sqrt{\frac{P_i}{P_c}}$$

$$\frac{P_i}{P_c} = \frac{9}{16}$$

90. *Ans. (c)*

91. *Ans. (a)*

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$

$$\frac{2000}{200} = \frac{N_1}{66}$$

$$N_1 = \frac{2000 \times 66}{200} = 660$$

92. *Ans. (c)*

93. *Ans. (a)*

94. *Ans. (c)*

95. *Ans. (d)*

$$\begin{aligned} B &= \mu H \\ &= \mu_0 \mu_r H \quad [\mu_r = 1 \text{ in air}] \\ &= 4\pi \times 10^{-7} \times 800 \\ &= 1 \text{ mWb/m}^2 \end{aligned}$$

96. *Ans. (a)*

97. *Ans. (c)*

98. *Ans. (c)*

99. *Ans. (b)*

100. *Ans. (a)*

101. *Ans. (c)*

102. *Ans. (d)*

Minus sign in the expression $e = -N \frac{d\phi}{dt}$ is due to Lenz's law.

103. *Ans. (b)*

104. *Ans. (a)*

105. *Ans. (d)*

106. *Ans. (a)*

107. *Ans. (a)*

108. *Ans. (d)*

X is the fraction of full load kVA at which the efficiency of transformer is maximum.

109. *Ans. (d)*

110. *Ans. (c)*

$$8 \times 2 \times 10^3 = 16 \text{ kVA}$$

111. *Ans. (a)*

112. *Ans. (d)*

$$A \propto \frac{1}{f}$$

$f =$ frequency

where

113. *Ans. (c)*

114. *Ans. (a)*

115. *Ans. (b)*

116. *Ans. (a)*

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$

$$N_2 = \frac{V_2 \cdot N_1}{V_1}$$

$$= \frac{400 \times 1000}{250}$$

$$= 1600$$

117. *Ans. (a)*

118. *Ans. (b)*

$$\eta_{F.L.} = \frac{10 \times 10^3 \times 0.8}{10 \times 10^3 \times 0.8 + 340 + 168}$$

$$\approx 94\%$$

119. *Ans. (d)*

120. *Ans. (a)*

121. *Ans. (d)*

122. *Ans. (b)*

123. *Ans. (d)*

124. *Ans. (d)*

125. *Ans. (d)*

126. *Ans. (b)*