Dronacharya College of Engineering

Department of Applied Sciences and Humanities

Set of Important Long Answer Questions

Subject : Electrical Technology (EE-101-F) **Sem: I**

Short Answer Question

Q.1 Explain – Force, weight and electrical energy

Q.2 Define KCL and KVL

Q.3 What is Ohm's Law ? Explain kirchoff's current law and Kirchoff's voltage law?

Q.4 What is an ideal transformer, is such a transformer possible ?

Q.5 Estimate the inductance of a solenoid of 2500 turns, uniformly wound over a length of 0.5 meter on a cylindrical paper tube, 10 cm is the diameter. The medium is air.

Q.6 Find the capacitance of a parallel plate capacitor Area of each plate is 50 cm 2 and distance between plates is 0.2mm. The medium is Air. For an applied voltage of 100V find charge, electric flux density and electric field strength.

Q.7 A coil has 500 turns. It is wound on an nonmagnetic core and has inductance of 9mH. a) Find the Flux produced by a current of 6 A. b) If this 6A current is reversed in 8 milliseconds. Find the emf induced

Q.8 Explain Moving iron type and moving coil type Instruments. Explain Watt meter and Energy meter.

Q.9 A Series R-L Circuit has a resistance of 9 ohms and an inductive reactance of 12 ohms.
When voltage v is applied, the current is i=28.3 sin 314t Find Z, V, L , P And Power factor. Draw phasor Diagram.

Q.10. (a) Differentiate Primary cells and Secondary cells.
(b) Draw the neat sketch and explain the construction and operation of Lead Acid

Q.11 Fill in the blanks (each question carry 2 marks)
1. Ohm meter is unit of _____
2. In magnetic circuit flux is equal to _____.
3. If the two charges Q1 and Q2 are separated by a distance "r" Force is_____
4. Ferromagnetic material loses their _____ properties at a certain temperature are called as_____.

5. Permeability of magnetic material corresponds to_____ in conducting material as_____.

Q.12
1. The perfect magnetic insulator is
(a) iron (b) rubber (c) copper (d) None of the above

2. Diamagnetic materials are _____
(a) Nickel (b) Silver, Copper (c) Copper, Aluminium (d) None of these

3. IF the conductor is at 90° the direction of the field =90° the force on the conductor is
(a) BIL (b) 0 (c) 1 (d) BIL Sin?

4. The hystersis loss in a magnetic material depends up on
a. area of hystersis loop
b. frequency of reversal of field
c. volume of magnetic material
d. all a,b and c

5. The direction of Electro-magnetically induced e.m.f. is determined by
a. Fleming right hand rule
b. Lenz's rule
c. Right hand thumb rule
d. Both a and b

Q13. What is the applicability of Low Voltage, High Current Power distribution systems And the application that it would be most reliable?

Q14. How can I size a three phase transformer for single phase Transformer

Q15. Explain Open and Short Circuit Tests

Q16. What is the reason for heating of DBR-dynamic breaking resistance?

Q17. What is transformer tapping?

Q18 Calculate the voltage induced in the armature winding of a 4-pole, lap wound de machine having 728 active conductors and running at 1800 rpm. The flux per pole is 30 mWb. If the armature is designed to carry a maximum line current of 100 A., what is the maximum electrom agnetic power developed by the armature?

Q19 A 4-pole, 3-phase induction motor is energized from a 60 Hz supply, and is running at a load condition for which the slip is 0.03. Determine: (a) Rotor speed, in rpm (b) Rotor current frequency, in Hz (c) Speed of the rotor's rotating magnetic field with respect to the stator frame, in rpm.

Q20 Discuss the principle of operation of a single phase induction motor. How the motor is started? Explain anyone method of starting.

Q21 A 3-phase voltage source has a phase voltage of 120 V. and supplies star connected load having impedance 36 + j48 ohm per phase. Calculate

(a) The line Voltage
(b) The line current
(c) The power factor
(d) The total 3 phase power supplied to the load

Q22 Discuss the moving iron principle, construction and operation of type measuring instruments.

Q23 Explain two wattmeter method to determine power in 3 phase system.

Q24 Discuss the voltage structure of the electric power system. Give the concept of grid.

Q25 The core of a magnetic circuit is of mean length 40 demand uniform cross-sectional area 4 cm. The relative permeability of the core material is 1000. An air gap of 1 mm is cut in the core, and 1000 turns are wound on the core. Determine the inductance of the coil if fringing is negligible.

Q26 Briefly discusses the principle of operation of alternator and also gives its applications. Draw V curve for synchronous motor.

D.C. MACHINES

Q27 State Faraday's law of Electromagnetic Induction.

Q28 State Fleming's left hand thumb rule.

Q29.What are the different methods of Speed Control in a d.c Motor ?

Q30.State Fleming's right hand thumb rule.

Q31. What is Commutation?

Q32. What are the various losses in DC Machines?

Q33. Define critical field resistance in DC shunt generator.

Q34. Define critical speed in DC shunt generator.

Q35. How do you reverse the direction of a d.c Motor?

Q35. List any two conditions for voltage build-up of a dc shunt generator.

Q36. Define the term armature reaction.

Q37. What are the effects of armature reaction?

Q38. What is the function of interpoles?

Q39. What are the reasons which causes the terminal voltage of DC shunt generator to get decreased as load current is increased?

Q40. State the basic parts of D.C Machine.

Q41. Write down the emf equation for d.c.generator?

Q42. Why the armature core in d.c machines is constructed with laminated steel sheets instead of solid steel sheets?

Q43. Why commutator is employed in d.c.machines?

Q44. Distinguish between shunt and series field coil construction.

Q45. How does d.c. motor differ from d.c. generator in construction?

Q46.How will you change the direction of rotation of d.c.motor?

Q46. What is back emf in d.c. motor?

Transformers

Q47. What are the two types of transformer cores used?
(1) core type (2)shell type.

Q48. What is a transformer ? Define an ideal transformer?

Q49.What are the test to be connected in a transformer to obtain its Equivalent circuit?
(a)Open circuit test (b)Short circuit test

Q50. Why transformer are rated in KVA?

Q51. What is the necessity of using stepped core ?

Q52.What are Instrument transformer.

Q53. What is the purpose of constructing transformer core by silicon content steel laminations?

Q54. Name two important electrical performances of transformers .

Q55. Mention the difference between core and shell type transformers?

Q56. What is the purpose of laminating the core in a transformer?

Q57. Give the emf equation of a transformer and define each term?

Q58. Does transformer draw any current when secondary is open? Why?

Q59. Define voltage regulation of a transformer?

Q60. Full load copper loss in a transformer is 1600W. what will be the loss at half load?

Q61. Define all day efficiency of a transformer?

Q62. Why transformers are rated in kVA?

Q63. What are the typical uses of auto transformer?

Q64. What is the application of step-up & step-down transformer?

Q65. Mention the difference between core and shell type transformers?

Q66. What is the purpose of laminating the core in a transformer.

Q67. How transformers are classified according to their construction?

Q68. Explain on the material used for core construction?

Q69. How does change in frequency affect the operation of a given transformer?

Q70. What is the angle by which no-load current will lag the ideal applied voltage?

Induction Motors

Q71. What are the advantages of phase Induction motor?

Q72. How can the direction of rotation of a 3phase Induction motor be reversed?

Q73. What are the effects of in increasing rotor resistance on starting current and starting torque?

Q74. Why it is not possible for the rotor speed of an Induction motor to be equal to the speed of its rotating magnetic field?

Q75. What are the advantages of slip ring Induction motor over cage motors?

Q76.State the different modes of operation of 3 phase Induction machines?

Q77. What are the methods of speed contol in Induction motors?

Q78. In what respect does the cage induction motor differ from slip ring induction motor?

Q79. Name the two different theories with which principle of 1 phase Induction Motors are explained.

Q80. Why are centrifugal switches provided on many 1 phase Induction motors?

Q81.Distinguish between capacitor start and run induction motors ?

Q82. How is the direction of a capacitor Induction motor be reversed?

Q83. What will be the direction of rotation of a shaded pole 1 phase Induction motor?

Q84. What are the inherent characteristics of plain 1 phase Induction motor?

Q85. Which type of 1 phase Induction motor would you use for the following application?

Q86.What could be the reasons if split phase motor fails to start and hums loudly?

Q87. What could be the reasons if a split phase motor runs too slow?

Q88. What are the 2 types of 3phase induction motor?

Q89. Why an induction motor is called as rotating transformer?

Q90. Why an induction motor never runs at its synchronous speed?

Synchronous and special machines

Q91. What are the advantages of rotating field system?

Q92. How are alternators classified?

Theorems

Q93. Define Thevenin Theorem.

Q94. Define Norton's Theorem.

Q95. Define Millman's Theorem.

Q96. Define Superposition Theorem.

Q97. Define Maximum Power Transfer Theorem and derive its formula.

Q98. Explain Star to Delta and Delta to Star connections.

Q99. Explain Nodal and loop method analysis with examples.

Q100. Explain the power equation and measuring of power by two wattmeter method

Set of Important Long Answer Questions

Section A

DC Network Laws and Theorems

Q.1 (a) What is Ohm's Law? Explain with the help of diagram.

(b) What are the various types of resistors?

Q.2 (a) What are the different symbols used in electrical circuits?

(b) What is Kirchoff's Current Law?

(c) What is Kirchoff's Voltage Law?

Q.3 What is Thevenin theorem?

Q.4 What is Superposition theorem ? Explain with a diagram.

Q.5 (a) Explain Delta to Star transformation of electrical circuits.

(b) Explain Star to Delta transformation of electrical circuits.

Q.6 What is Norton's theorem?

Q.7 What is Millmain theorem? Explain with a diagram as applicable to Current source and Voltage source.

Q.8 What is Maximum Power Transfer theorem? Draw an equation for Maximum Power.

Section 'B'

Single Phase AC Circuits

Q.9 (a) Discuss the differences between DC and AC current.

(b) Derive an equation for emf generated and current for AC machines.

Q.10 Explain the following voltages/currents

(i) Instantaneous and peek value

(ii) RMS value

(iii) Average value

(iv) Crest and Peak factor

Q.11 How the alternating voltages/currents are represented. Explain Polar Coordinate representation.

Q.12 Explain rectangular representation of AC voltage/current.

Q.13 Explain exponential and trigonometric representation of AC voltages/currents.

Q.14 (a) Explain the functioning of AC through resistances and inductance series circuits.

(b) Explain the functioning of AC through resistances and capacitance series circuits.

Q.15 Explain the following

(a) Power factor

(b) Active Power

(c) Reactive Power

(d) Q. Factor

Q.15 (a) Explain resonance in a R-L-C- series circuit.

(b) Also draw diagram for various parameters

Q.16 (a) Explain resonance in an R-L-C parallel circuit

(b) Also draw diagram for various parameters.

Section C

Three Phase AC Circuits

Q.17 How three phase voltages are generated. Explain with the help of a diagram.

Q.18 Explain three phase star connection along with expressions for line/phase voltages and currents.

Q.19 Explain three phase delta connection along with expressions for line/phase voltages and currents.

Q.20 Explain the construction of a transformer.

Q.21 What is an ideal transformer. Derive an emf equation for a transformer.

Q.22 Discuss the operation of transformer under "No load" and "On load" conditions.

Q.23 Explain the procedure for measurement of power by two wattmeter method.

Section 'D'

Electrical Machines and Measuring Instruments

Q.24 Explain the construction and working of a transformer.

Q.25 Explain the following in respect of transformer:

a) Magnetic Leakage

b) Equivalent Circuit

c) Short Circuit test

d) Regulation of Transformer

e) Losses of Transformer

Q.26 Explain the construction of DC generators.

Q.27 Derive an expression for EMF equation of a DC generator.

Q.28 What are the difference between DC machines, induction motors and synchronous machines.

Q.29 Explain the construction, operation and uses of moving iron type instruments.

Q.30 Explain the construction, operation and uses of moving coil type instruments.

Q.31 Explain the construction, operation and uses of induction type meters.

Set of Possible Short Answer / Objective Type Questions

SECTION 'A'

Q.1 A 100μA ammeter has an internal resistance of 100 Ω. For extending its range to measure 500 μA, the shunt required is of resistance (in Ω)

a) 20.0

b) 22.22

c) 25.0

d) 50.0

Q.2 Resistances R_1 and R_2 have, respectively, nominal values of 10 Ω and 5 Ω, and tolerances of ± 5% and ± 10%. The range of values for the parallel combination of R_1 and R_2 is

a) 3.077 Ω to 3.636 Ω

b) 2.805 Ω to 3.371 Ω

c) 3.237 Ω to 3.678 Ω

d) 3.192 Ω to 3.435 Ω

Q.3 The open circuit impedance of a certain length of a loss-less line is 100 Ω. The short circuit impedance of the same line is also 100 Ω. The characteristic impedance of the line is

a) 100 $\sqrt{2}$ Ω

b) 50 Ω

c) $\frac{100}{\sqrt{2}}\Omega$

d) 100 Ω

Q.4 The current in the given circuit with a dependent voltage source is

a) 10A

b) 12A

c) 14A

d) 16A

Q.5 In the circuit shown in fig. 1.104 of I when V_s = 16V, is

a) 6A

b) 8A

c) 10A

d) 12A

Q.6 The *rms* value of the resultant current in a wire which carries a dc current of 10A and a sinusoidal alternating current of peak value

a) 14.1 A

b) 17.3 A

c) 22.4 A

d) 30.0 A

Q.7 Kirchoff's current law is applicable to only

a) closed loops in a network

b) electronic circuits

c) junctions in a network

d) electric circuits.

Q.8 Kirchoff's voltage law is concerned with

a) IR drops

b) battery e.m.fs.

c) junction voltages

d) both (a) and (b)

Q.9 According to KVL, the algebraic sum of all IR drops and e.m.f.s in any closed loop of a network is always

a) zero

b) positive

c) negative

d) determined by battery e.m.fs.

Q.10 The Algebraic sign of an IR drop is primarily dependent on the

a) amount of current flowing through it

b) value of R

c) direction of current flow

d) battery connection

Q.11 Maxwell's loop current method of solving electrical networks

a) uses branch currents

b) utilizes Kirchoff's voltage law

c) is confined to single-loop circuits

d) is a network reduction method

Q.12 Point out of the WRONG statement. In the node-voltage technique of solving networks, choice of a reference node does not

a) affect the operation of the circuit

b) change the voltage across any element

c) alter the p.d between any pair of nodes

d) affect the voltages of various nodes

Q.13 The component inductance due to the internal flux-linkage of a non-magnetic straight solid circular conductor per meter length, has a constant value and is independent of the conductor-diameter because

a) All the internal flux due to a current remains concentrated on the peripheral region of the conduntor.

b) The internal magnetic flux-density along the radial distance from the centre of the conductor increases proportionately to the current enclosed

c) The entire current is assumed to flow along the conductor –axis and the internal flux is distributed uniformly and concentrically

d) The current in the conductor is assumed to be uniformly distributed throughout the conductor cross-section.

SECTION 'B'

Q.14 An a.c. current given by i = 14.14 sin (wt + $\pi/6$)has an r.m.s value of -- amperes.

a) 10

b) 14.14

c) 1.96

d) 7.07

and a phase of – degrees.

e) 180

f) 30

g) -30

h) 210

Q.15 If e_1 = A sin wt and e_2 =B sin (wt – ϕ), then

a) e_1 lags e_2 by θ

b) e_2 lags e_1 by θ

c) e_2 leads e_2 by θ

d) e_1 is in the phase with e_2

Q.16 From the two voltage equations $e_A = E_m$ sin 100 πt and $e_B = E_m$ sin (100 πt + π/6), it is obvious that

a) A leads B by 30 ̊

b) B achieves its maximum value 1/600 second before A does

c) B lags behind A

d) A achieves its zero value 1/600 second before B.

Q.17 The r.m.s. value of a half-wave rectified current is 10A, its value for full-wave rectification would be --- amperes

a) 20

b) 14.14

c) 20/ π

d) 40/π

Q.18 A resultant current is made of two components : a 10 A d.c. component and a sinusoidal component of maximum value 14.14 A. The average value of the resultant current is --- amperes.

a) 0

b) 24.14

c) 10

d) 4.14

and r.m.s value is – amperes

e) 10

f) 14.14

g) 24.14

h) 100

Q.19 The r.m.s value of sinusoidal a.c. current is equal to its value at an angle of --- degree

a) 60

b) 45

c) 30

d) 90

Q.20 Two sinusoidal currents are given by the equations : i_2 = 10 sin (wt + $\pi/3$) and i_2 = 15 sin 9wt + $\pi/4$). The phase difference between them is – degrees.

a) 105

b) 75

c) 15

d) 60

Q.21 As sine wave has a frequency of 50Hz. Its angular frequency is –radian/per second.

a) 50/ π

b) 50/2 π

c) 50 π

d) 100 π

Q.22 An a.c. current is given by I = 100 sin 100. It will achieve a value of 50 A after – second.

a) 1/600

b) 1/300

c) 1/1800

d) 1/900

Q.23 The reactance offered by a capacitor to alternating current of frequency 50Hz is 10Ω. If frequency is increased to 100 Hz reactance between –ohm.

a) 20

b) 5

c) 2.5

d) 40

SECTION 'C'

Q.24 A transformer transforms

a) frequency

b) voltage

c) current

d) voltage and current

Q.25 The main purpose of using core in a transformer is to

a) decrease iron losses

b) prevent eddy current loss

c) eliminate magnetic hysteresis

d) decrease reluctance of the common magnetic circuit.

Q.26 A transformer having 1000 primary turns is connected to a 250-V a.c. supply. For a secondary voltage of 400 V, the number of secondary turns should be

a) 1600

b) 250

c) 400

d) 1250

Q.27 The primary and secondary induced e.m.fs. E_1 and E_2 in a two winding transformer are always

a) equal in magnitude

b) antiphase with each other

c) in-phase with each other

d) determined by load on transformer secondary

Q.28 The primary and secondary windings of an ordinary 2-winding transformer always have

a) different number of turns

b) same size of copper wire

c) a common magnetic circuit

d) separate magnetic circuit

Q.29 In relation to a transformer, the ratio 20:1 indicates that

a) there are 20 turns on primary one turn on secondary

b) secondary voltage is $1/20^{th}$ of primary voltage

c) primary current is 20 times greater than the secondary current

d) for every 20 turns on primary, there is one turn on secondary

Q.30 The equivalent resistance of the primary of a transformer having K = 5 and R_1 = 0.1 ohm when referred to secondary becomes---- ohm

a) 0.5

b) 0.02

c) 0.004

d) 2.5

Q.31 The main purpose of performing open-circuit test on a transformer is to measure its

a) Cu loss

b) core loss

c) total loss

d) insulation resistance

Q.32 The voltage applied to the h.v.side of a transformer during short circuit test is 2% of its rated voltage. The core loss will be ----- percent of the rated core loss.

a) 4

b) 0.4

c) 0.25

d) 0.04

Q.33 When a 400 Hz transformer is operated at 50 Hz its kVA rating is

a) reduced to 1/8

b) increased 8 times

c) unaffected

d) increased 64 times

Q.34 At relatively light loads, transformer efficiency in low because

a) secondary output is low

b) transformer losses are high

c) fixed loss is high in proportion to the output

d) Cu loss is small

Q.35 If Cu loss of a transformer at $7/8^{th}$ full load is 4900 W, then its full load Cu loss would be --- watt

a) 5600

b) 6400

c) 375

d) 429

Q.36 The maximum efficiency of a 100-kVA transformer having iron loss of 900 kW and F.L. Cu loss of 1600 W occurs at -----kVA

a) 56.3

b) 133.3

c) 75

d) 177.7

SECTION'D'

Q.37 The kWh meter can be classified as a/an-instrument :

a) deflecting

b) digital

c) recording

d) indicating

Q.38 The moving system of an indicating type of electrical instrument is subjected to :

a) a deflecting torque

b) a controlling torque

c) a damping torque

d) all of the above

Q.39 The damping force acts on the moving system of an indicating instrument only when it is :

a) moving

b) stationary

c) near its full deflection

d) just starting to move

Q.40 The most efficient form of damping employed in electrical instruments is :

a) air friction

b) fluid friction

c) eddy currents

d) none of the above

Q.41 Moving iron instruments can be used for measuring :

a) direct current and voltages

b) alternating current and voltages

c) radio frequency currents

d) both (a) and (b)

Q.42 Permanent-magnet moving- coil ammetere have uniform scales because :

a) eddy currents damping

b) they are spring – controlled

c) their reflecting torque varies directly as current

d) both (b) and (c)

Q.43 The meter that is suitable for only direct current measurements is :

a) moving-iron type

b) permanent – magnet type

c) electrodynamic type

d) hot-wire type

Q.44 A moving coil voltneters measures –

a) only a.c. voltages

b) only d.c. voltages

c) both a.c. and d.c. voltages

Q.45 The external characteristic of a shunt generator can be obtained directly from its ----- characteristic.

a) internal

b) open-circuit

c) load-saturation

d) performance

Q.46 Load saturation characteristic characteristic of a d.c.generator gives relation between

a) V and I_a

b) E and I_a

c) E_o and I_f

d) V and I_f

Q.47 The slight curvature at the lower end of the O.C.C. of a self-excited d.c. generator is due to

a) residual pole flux

b) high armature speed

c) magnetic inertia

d) high field circuit resistance

Q.48 For the voltage built-up of a self-excited d.c. generator, which of the following is not an essential condition?

a)There must be some residual flux

b) Field winding mmf aid the residual flux

c) Total field circuit resistance mu8st be less than the critical value

d) Armature speed must be very high

Q.49 The voltage build-up process of a d.c. generator is

a) difficult

b) delayed

c) cumulative

d) infinite

Q.50 Which of the following d.c. generator cannot build up on open- circuit?

a) shunt

b) series

c) short shunt

d) long shunt

Q.51 If a self-excited d.c. generator after being installed, fails to build up on its first trial run, the first thing is to do is to

a) increase the field resistance

b) check armature insulation

c) reverse field connection

d) increase the speed of prime mover

Q.52 If residual magnetism of a shunt generator is destroyed accidently, it may be restored by connecting its shunt field

a) to earth

b) to an a.c. source

c) in reverse

d) to a d.c. source

Q.53 The three factors which cause decrease in the terminal voltage of a shunt generator are

a) armature reactances

b) armature resistance

c) armature leakages

d) armature reaction

e) reduction in field current

Q.54 If field resistance of a d.c. shunt generator is increased beyond its critical value, the generator

a) output voltage will exceed its name-plate rating

b) will not build up

c) may burn out if loaded to its name-plate rating

d) power output may exceed its name-plate ratung