



భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

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Advertisement No. IITH/2023/NF/15

Question Paper ID: 105

Application Number of the Candidate

Name of the Post: JE Electrical

Pay Level:

Date & Time of the Exam: 7th Dec 2023

Duration: 01 hr. 30 min

Scheme of the Exam:

Topic	Number of Question	Marks
General English (Communication Skills)	10	10
Work Related Topics	90	90
Total	100	100

Instructions to fill the responses in the OMR answer sheet

1. Candidate must write his/her **application number** in the designated box on the top of OMR answer sheet
2. Candidate must write the Question paper ID in the designated box on the top of OMR answer sheet
3. Candidate must sign in the box provided in the OMR answer sheet
4. Each answer sheet must be signed by the invigilator in the space printed in the OMR answer sheet
5. Only one response to be selected & marked. In case more than one response is marked for a single question or no response is marked for a question, no marks will be awarded for that question.
6. Partially filled circles shall not be considered as responses
7. Erasing or changing of answer is not allowed.
8. No negative marking
9. Candidate must use Blue/Black ball point pen to fill his/her responses
10. Rough work should not be done on the OMR answer sheet.
11. Candidate can use the designated page(s) of the question booklet for the purpose of rough work
12. Question booklet needs to be returned along with the OMR answer sheet.

Electrical Engineering

Attempt all questions.

All questions carry 1 mark each unless stated otherwise.

- 1 What is the current passing through the capacitor if the voltage across it is constant?
 - a. 1
 - b. 0
 - c. -1
 - d. Infinity

- 2 An Inductor works as a _____ circuit for DC supply.
 - a. Open
 - b. Short
 - c. Polar
 - d. Non-polar

- 3 The unit of reactance is
 - a. Ohm
 - b. Volt
 - c. Mho
 - d. Newton

- 4 The filament of 120W and 200 W bulbs are of same length. Then:
 - a. 120W filament is thicker.
 - b. 200W filament is thicker.
 - c. Both are of same thickness.
 - d. Both cannot have same length

- 5 If a wire is stretched to make it double longer, its resistance will (under uniform change in cross-sectional area)
 - a. Increase by 4 times.
 - b. Increase by 2 times.
 - c. Decrease by 4 times.
 - d. Decrease by 2times

- 6 The resistance of silver wire at 0 degrees is R ohms. Up to what temperature it must be heated so that its resistance is doubled? (given α for silver=0.0041 Degree/Centigrade)
- 350 °C
 - 200 °C
 - 244 °C
 - 300 °C
- 7 Kirchoff's voltage law is used in formation of
- Nodal equation
 - Loop equation
 - Both
 - None of these
- 8 Superposition theorem can be applied only to the circuits having
- Resistive elements
 - Passive elements
 - Non-linear elements
 - Linear bilateral elements
- 9 Kirchoff's current law states that
- net current flow at the junction is positive
 - Algebraic sum of the currents meeting at the junction is zero
 - No current can leave the junction without some current entering it.
 - total sum of currents meeting at the junction is zero
- 10 Thevenin resistance R^{th} is found
- by removing voltage sources along with their internal resistances
 - by short-circuiting the given two terminals
 - between any two 'open' terminals
 - between same open terminals as for E^{th}
- 11 An ideal voltage source should have
- large value of e.m.f.
 - small value of e.m.f.
 - zero source resistance
 - infinite source resistance

- 12 Let us assume that resistors are connected in Delta (Δ). If all the resistance values of the Delta connection are scaled by a factor K , ($K > 0$), the values of the corresponding Star (Y) equivalent will be scaled by a factor of
- K^2
 - K
 - $1/K$
 - \sqrt{K}
- 13 How many 230 W, 230 V incandescent lamps connected in series would consume the same total power as a single 115 W, 230 V incandescent lamp?
- 1
 - 2
 - 3
 - 4
- 14 A voltage waveform $v(t) = 60t^2$ is applied across a $1.0H$ inductor for $t \geq 0$, with initial current through it being zero. The current through the inductor for $t \geq 0$ is given by
- $15t$
 - $20t^2$
 - $15t^3$
 - $20t^3$
- 15 Two parallel connected 20 Ohm resistances are connected in series with a unknown resistance. When this entire circuit is connected in parallel with a 200V DC voltage source, it draws 10A. What is the unknown resistance value?
- 10 ohms
 - 5 ohms
 - 7.5 ohms
 - 15 ohms
- 16 An ideal voltage source will charge an ideal capacitor
- in infinite time
 - exponentially
 - instantaneously
 - None of these

- 17 A rectangular voltage pulse of magnitude V and duration T is applied to a series combination of resistance R and capacitance C . The maximum voltage developed across the capacitor is
- $V \left[1 - \exp\left(\frac{-t}{RC}\right) \right]$
 - $\frac{VT}{RC}$
 - V
 - $V \left[\exp\left(\frac{-t}{RC}\right) \right]$
- 18 The average power delivered to an impedance $(4 - j6)\Omega$ by a current $10 \cos(100\pi t + 100)$ A is
- 500
 - 200
 - 800
 - 700
- 19 In a series RLC circuit at resonance, the magnitude of the voltage developed across the capacitor
- Is always zero.
 - Can never be greater than the input voltage.
 - Can be greater than the input voltage, however, it is 90° out of phase with the input voltage.
 - Can be greater than the input voltage, and is in phase with the input voltage.
- 20 A circuit with a resistor, inductor and capacitor in series is resonant at f_r Hz. If all the component values are now made half, the new resonant frequency is
- $2 f_r$
 - f_r
 - $f_r/4$
 - $f_r/2$
- 21 The DC motor, which can provide zero speed regulation at full-load without any controller, is
- Series
 - Shunt
 - Cumulative compound
 - Differential compound

- 22 Neglecting all losses, the developed torque (T) of a DC separately excited motor, operating under constant terminal voltage, is related to its output power (P) as under:
- $T^2 \propto P$
 - $T \propto P$
 - $T^2 \propto P^3$
 - T independent of P
- 23 In transformers, which of the following statements is valid?
- In an open-circuit test, copper losses are obtained while in short-circuit test, core losses are obtained
 - In an open-circuit test, current is drawn at high power factor
 - In a short-circuit test, current is drawn at zero power factor
 - In an open-circuit test, current is drawn at low power factor
- 24 In the protection of transformers, harmonic restraint is used to guard against
- Magnetizing inrush current
 - Unbalanced operation
 - Lighting
 - Switching
- 25 A single-phase transformer is to be switched to the supply to have minimum inrush current. The switch should be closed at
- Peak value of the voltage
 - Zero point of the voltage
 - $1/\sqrt{2}$ of Peak value of the voltage
 - $1/2$ Peak value of the voltage
- 26 If an AC voltage wave is corrupted with an arbitrary number of harmonics, then the overall voltage waveform differs from its fundamental frequency component in terms of
- Only the peak values
 - Only the rms values
 - Only the average values
 - All the three measures (peak, rms and average values)

- 27 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
- 28 Two transformers of different kVA ratings working in parallel to share the load in proportional to their ratings when their
- Per unit leakage impedances on the same kVA base are the same
 - Per unit leakage impedances on their respective ratings are equal
 - Ohmic values of the leakage impedances are inversely proportional to their ratings
 - Ohmic values of the leakage magnetizing reactances are the same
- 29 A single phase transformer has a maximum efficiency of 90% at full-load of unity power factor. Efficiency at half load at the same power factor is
- 86.7%
 - 88.26%
 - 88.9%
 - 87.8%
- 30 Leakage flux in an induction motor is
- Flux that leaks through the machine
 - Flux that links both stator and rotor windings
 - Flux that links none of the windings
 - Flux that links the stator winding or the rotor windings but not both
- 31 For an induction motor, operating at a slip s , the ratio of gross power output to air gap power is equal to
- $(1 - s)^2$
 - $(1 - s)$
 - $\frac{1}{(1-s)}$
 - $(s - 1)$

- 32 The direction of rotation of a 3-phase induction motor is clockwise when it is supplied with 3-phase sinusoidal voltage having phase sequence A-B-C. For counter-clockwise rotation of the motor, the phase sequence of the power supply should be
- $B - C - A$
 - $C - A - B$
 - $A - C - B$
 - $A - B - C$
- 33 The type of single-phase induction motor having the highest power factor at full load is
- Shaded pole type
 - Split-phase type
 - Capacitor-start type
 - Capacitor-run type
- 34 When the supply voltage to an induction motor is reduced by 10%, then the maximum torque will decrease by approximately
- 5%
 - 10%
 - 20%
 - 40%
- 35 In an induction motor, if the air gap is increased
- Speed will reduce
 - Efficiency will improve
 - Power factor will be lower
 - Breakdown torque will increase
- 36 Unbalanced supply voltage given to a 3-phase, delta connected induction motor will cause
- Zero sequence currents
 - Less heating of the rotor
 - Negative sequence components
 - All of these

- 37 A three phase slip ring induction motor is fed from the rotor side with stator winding short circuited. The frequency of the currents flowing in the short circuited stator is
- Slip frequency
 - Supply frequency
 - Frequency corresponding to rotor speed
 - Zero
- 38 A standalone engine driven synchronous generator is feeding a partly inductive load. A capacitor is now connected across the load to completely nullify the inductive current. For this operating condition.
- The field current and fuel input have to be reduced
 - The field current and fuel input have to be increased
 - The field current has to be increased and fuel input left unaltered
 - The field current has to be reduced and fuel input left unaltered
- 39 X_d , X'_d and X''_d are steady state d-axis synchronous reactance, transient d-axis reactance, and sub-transient d-axis reactance of a synchronous machine respectively, then which of the following statements is true?
- $X_d > X'_d > X''_d$
 - $X_d < X'_d < X''_d$
 - $X'_d > X''_d > X_d$
 - $X_d > X''_d > X'_d$
- 40 The phase sequence of a three-phase alternator will reverse if
- The field current is reversed keeping the direction of rotation same
 - The field current remains the same but the direction of rotation is reversed
 - The field current is reversed and the number of poles is doubled
 - The number of poles is doubled without reversing the field current
- 41 The torque angle of a synchronous machine operating from a constant voltage bus, is usually defined as the space angle between
- Rotor mmf wave and stator mmf wave
 - Rotor mmf wave and resultant flux density wave
 - Stator mmf wave and resultant flux density wave
 - Stator mmf wave and resultant mmf wave

- 42 A half-controlled single-phase bridge rectifier is supplying an R-L load. It is operated at a firing angle α and the load current is continuous. The fraction of cycle that the freewheeling diode conducts is
- $\frac{1}{2}$
 - $\left(1 - \frac{\alpha}{\pi}\right)$
 - $\frac{\alpha}{2\pi}$
 - $\frac{\alpha}{\pi}$
- 43 Two wattmeter method is used for measurement of power in a balanced three – phase load supplied from a balanced three – phase system– If one of the wattmeters reads half of the other (both positive), then the power factor of the load is
- 0.532
 - 0.632
 - 0.707
 - 0.866
- 44 A 4Ω resistance is connected across a source that has a load line $(v + i) = 250$. The current through the resistance is
- 100
 - 50
 - 40
 - 30
- 45 A practical current source is usually represented by
- a resistance in series with an ideal current source.
 - a resistance in parallel with an ideal current source.
 - a resistance in parallel with an ideal voltage source.
 - a inductor in parallel with an ideal voltage source.
- 46 Energy stored in a capacitor over a cycle, when excited by an AC source is
- the same as that due to a DC source of equivalent magnitude.
 - half of that due to a DC source of equivalent magnitude.
 - zero.
 - None of the above

- 47 What is the time constant of the network consisting of a resistance (R) is connected in series with a parallel combination circuit formed with a resistance (2R) and a capacitor (C)
- $2RC$
 - $3RC$
 - $\frac{RC}{2}$
 - $\frac{2RC}{3}$
- 48 In an ideal transformer, the only flux exists is the
- Leakage flux
 - Flux due to load current
 - Flux which links the primary and secondary windings
 - Flux which links the windings and the leakage flux together
- 49 For obtaining maximum torque at starting in an induction motor, the following condition should be satisfied.
- $R_2 = X_2$
 - $R_2 = 2X_2$
 - $2R_2 = X_2$
 - $R_2 = 4X_2$
- 50 The lines of force due to charged particles are
- always straight
 - always curved
 - sometimes curved
 - none of the above
- 51 A capacitor stores 0.24 coulombs at 10 volts. Its capacitance is
- 0.024 F
 - 0.12 F
 - 0.6 F
 - 0.8 F
- 52 For making a capacitor, it is better to select a dielectric having
- low permittivity
 - high permittivity

- c. permittivity same as that of air
d. permittivity slightly more than that of air
- 53 A dielectric material must be
- (a) resistor
 - (b) insulator
 - (c) good conductor
 - (d) semi conductor
- 54 Tesla is a unit of
- a. field strength
 - b. inductance
 - c. flux density
 - d. flux
- 55 The magnetism left in the iron after exciting field has been removed is known as
- a. permeance
 - b. residual magnetism
 - c. susceptance
 - d. reluctance
- 56 Which of the following inductor will have the least eddy current losses ?
- a. Air core
 - b. Laminated iron core
 - c. Iron core
 - d. Powdered iron core
- 57 What is the relation between electrical degrees, number of poles (P) and mechanical degrees?
- a. Electrical angle = $\left(\frac{P}{2}\right)$ (mechanical angle)
 - b. Electrical angle = $(2 * P)$ (mechanical angle)
 - c. Electrical angle = $\left(\frac{2}{P}\right)$ (mechanical angle)
 - d. Electrical angle = (P) (mechanical angle)

- 58 How can we change the direction of rotation of a self-excited DC shunt motor?
- reversing both field terminals and armature terminals
 - reversing the field terminals or reversing the armature terminals
 - both (A) & (B)
 - reversing the input supply terminals
- 59 What is the typical range of phase angle between input voltage and input current of a 1-phase transformer under no-load conditions?
- about $5^\circ - 10^\circ$
 - about $10^\circ - 15^\circ$.
 - about $15^\circ - 20^\circ$
 - about $77^\circ - 88^\circ$.
- 60 What is the unit of Magnetomotive force?
- Volt
 - Tesla
 - Ampere-turn
 - Weber
- 61 For which, the $B - H$ curve is straight line passing through the origin.
- Cobalt
 - Air
 - Hardened steel
 - Soft iron
- 62 Series resonance occurs under
- $X_L = X_C$
 - $X_L = R$
 - $Z = R$
 - Both (A) & (C)

- 63 In a 3 – phase induction motor, the maximum torque
- is proportional to rotor resistance R_2 .
 - Does not depend on R_2 .
 - is proportional to $\sqrt{R_2}$
 - is proportional to $(R_2)^2$
- 64 The DC series motor should always be started with load because
- At no load, it will rotate at dangerously high speed.
 - It will fail to start.
 - It will not develop high starting torque.
 - All are true.
- 65 A balanced three-phase, 50 Hz voltage is applied to a 3 phase, 4 pole induction motor. When the motor is delivering rated output, the slip is found to be 0.05. The speed of the rotor m.m.f. relative to the rotor structure is
- 1500 rpm.
 - 1425 rpm.
 - 25 rpm.
 - 75 rpm.
- 66 A DC shunt generator has a speed of 800 rpm when delivering 20 A to the load at the terminal voltage of 220V. If the same machine is run as a motor it takes a line current of 20A from 220V supply. The speed of the machine as a motor will be
- 800 rpm.
 - More than 800 rpm.
 - Less than 800 rpm.
 - Both higher or lower than 800 rpm.
- 67 In a 3-phase synchronous motor
- The speed of stator MMF is always more than that of rotor MMF.
 - The speed of stator MMF is always less than that of rotor MMF.
 - The speed of stator MMF is synchronous speed while that of rotor MMF is zero.
 - Rotor and stator MMF are stationary with respect to each other.

- 68 The synchronous reactance of the synchronous machine is _____.
- Ratio between open circuit voltage and short circuit current at constant field current
 - Ratio between short circuit voltage and open circuit current at constant field current
 - Ratio between open circuit voltage and short circuit current at different field current
 - Ratio between short circuit voltage and open circuit current at different field current
- 69 The synchronous speed for a 3 phase 6-pole induction motor is 1200 rpm. If the number of poles is now reduced to 4 with the frequency remaining constant, the rotor speed with a slip of 5% will be _____.
- 1690 rpm
 - 1750 rpm
 - 1500 rpm
 - 1710 rpm
- 70 In a D.C. generator the critical resistance can be increased by
- increasing its field resistance
 - decreasing its field resistance
 - increasing its speed
 - decreasing its speed
- 71 In an oscilloscope screen, linear sweep is applied at the
- vertical axis
 - horizontal axis
 - origin
 - both horizontal and vertical axis
- 72 Laminated insulations coated with varnish are normally used in the transformer
- To reduce reluctance of magnetic path
 - To reduce the effect of eddy current
 - To increase the reluctance of magnetic path
 - To reduce the hysteresis effect

- 73 Oil in transformer is used to
- Transfer electrical energy
 - Insulate the windings
 - Cool the windings
 - To increase the reluctance of magnetic path
- 74 A transformer is connected to a constant voltage source. If the supply frequency decreases, the magnetic flux in the core will
- Increase towards saturation
 - Decrease
 - Remain unchanged
 - Decrease at faster rate
- 75 The core flux in a transformer depends mainly on
- Supply voltage
 - Supply voltage and frequency
 - Supply voltage, frequency and load
 - Supply voltage and load but independent of frequency
- 76 A separately excited generator as compared to a self-excited generator
- is amenable to better voltage control
 - is more stable
 - has exciting current independent of load current
 - has all above features
- 77 In case of D.C. machine winding, number of commutator segments is equal to
- number of armature coils
 - number of armature coil sides
 - number of armature conductors
 - number of armature turns
- 78 Which of the following materials is a good Insulator?
- Aluminium
 - Copper
 - Porcelain
 - Silver

- 79 What is the property of a magnetic material which opposes the creation of magnetic flux in it
- Resistance
 - Reluctance
 - Inductance
 - Conductance
- 80 Which of the following law states that the magnitude of the induced EMF in a coil is directly proportional to the change of flux linkages
- Joule's law
 - Faraday's law of electromagnetic induction
 - Coulomb's law
 - Lenz's law
- 81 Which of the following law states that the polarity of the induced voltage will oppose the change in magnetic flux causing the induction.
- Joule's law
 - Faraday's law
 - Coulomb's law
 - Lenz's law
- 82 If residual magnetism is present in a D.C. generator, the induced EMF at zero speed will be
- zero
 - small
 - the same as rated voltage
 - high
- 83 Which of the following law can be used to determine the direction of rotation of D.C. motor?
- Fleming's right-hand rule
 - Faraday's rule
 - Coulomb's right-hand rule
 - Fleming's left-hand rule
- 84 The power mentioned on the name plate of an electric motor indicates
- the power drawn in kW
 - the power drawn in kVA
 - the gross power
 - the output power available at the shaft

- 85 Following winding in the transformer has more cross-sectional area
- Low voltage winding
 - High voltage winding
 - Primary winding
 - Secondary winding
- 86 The function of conservator in a transformer is
- to project against internal faults
 - to reduce copper as well as core losses
 - to cool the transformer oil
 - to take care of the expansion and contraction of transformer oil
- 87 The uncontrolled electronic switch employed in power electronic converters is
- Thyristor
 - Bipolar junction transistor
 - Diode
 - MOSFET
- 88 An average-reading digital multimeter reads 20 V when fed with a triangular wave, symmetric about the time axis. For the same input, an RMS reading meter will read as
- $\frac{20}{\sqrt{3}}$
 - $\frac{20}{\sqrt{2}}$
 - $\frac{40}{\sqrt{3}}$
 - $\frac{40}{\sqrt{2}}$
- 89 A geyser is switched on to the AC mains supplying power at 230 V, 50 Hz. The frequency of the instantaneous power consumed by the geyser is
- 50 Hz
 - 100 Hz
 - 150 Hz
 - 200 Hz
- 90 Two watt meters are connected to measure the total power on a three-phase system supplying a balanced load reads 21 kW and -5 kW respectively. The total power and power factor respectively are
- 26.0 kW, 0.334

- b. 26.0 kW, 0.684
- c. 16.0 kW, 0.52
- d. 16.0 kW, 0.334

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General English (Communication Skills)

Attempt all questions.

All questions carry 1 mark each unless stated otherwise.

91. Choose the word closest in meaning to the underlined section of the sentence:

There was a shadow across his face upon hearing the sad news.

- a. Complexion
- b. Look of gloom
- c. Shade
- d. Gravity

92. Choose the word closest in meaning to the underlined section of the sentence:

There was a persistent drizzle during our week-long holiday in Darjeeling.

- a. Consistent
- b. Incessant
- c. Continuous
- d. Intermittent

93. Choose the word most nearly opposite in meaning to the underlined section of the sentence:

Many people prefer a vegetarian diet.

- a. Abhor
- b. Desire
- c. Taste
- d. Like

94. Choose the word most nearly opposite in meaning to the underlined section of the sentence:

It was an arduous task.

- a. Difficult
- b. Problematic
- c. Effortless
- d. Fitting

95. Choose the correct meaning of the underlined section of the sentence:

He stood to his ground with firmness.

- a. Dug up the ground
- b. Built a house
- c. Maintained his position
- d. Built a wall

96. Choose the correct meaning of the underlined section of the sentence:

I did not notice in him anything out of the way.

- a. Familiar.
- b. Strange.
- c. Attractive.
- d. Charming.

97. Choose the best word to complete the given sentence:

The thief disappeared in a _____

- a. Day
- b. Run
- c. Trice
- d. Hurry

98. Choose the best word to complete the given sentence:

The odds against us were indeed _____

- a. Light
- b. Colorful
- c. Cheerful
- d. Heavy

99. Choose the correct preposition to fill in the blank in the sentence.

The celebrated grammarian Patanjali was a contemporary _____ Pushyamitra Sunga

- a. To
- b. With
- c. Of
- d. In

100. Choose the correct preposition to fill in the blank in the sentence.

The income derived _____ the ownership of land is commonly called rent.

- a. With
- b. For
- c. From
- d. Under

Answers keys

1	B
2	B
3	A
4	B
5	A
6	C
7	B
8	D
9	B
10	D
11	C
12	B
13	B
14	D
15	A
16	C
17	A
18	B
19	C
20	A`
21	D
22	B
23	D
24	A
25	A
26	D
27	C
28	B

29	D
30	D
31	B
32	C
33	D
34	C
35	C
36	C
37	A
38	D
39	A
40	B
41	A
42	D
43	D
44	B
45	B
46	C
47	D
48	C
49	A
50	B
51	A
52	B
53	B
54	C
55	B
56	A
57	A
58	B
59	D

60	C
61	B
62	D
63	B
64	A
65	D
66	C
67	D
68	A
69	D
70	C
71	B
72	B
73	C
74	A
75	B
76	D
77	A
78	C
79	B
80	B
81	D
82	A
83	D
84	D
85	A
86	D
87	C
88	C
89	B
90	D

91	B
92	B
93	A
94	C
95	C
96	B
97	C
98	D
99	C
100	C

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