

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet No. :

Series

01325

TEST BOOKLET

Paper—II

(ELECTRICAL ENGINEERING)



Time Allowed : 2 Hours

Full Marks : 100

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.
3. All questions carry equal marks.

The Answer-Sheet should be submitted to the Invigilator.

Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

Example :

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
- (B) London
- (C) Dhaka
- (D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

1. A wire of length l and of circular cross-section of radius r has a resistance of R ohm. Another wire of same material and cross-sectional radius $2r$ will have same resistance R , if the length is
- (A) $2l$
 (B) $4l$
 (C) $\frac{l}{2}$
 (D) $\frac{l}{4}$
2. Which of the following materials possesses the least resistivity?
- (A) Iron
 (B) Manganin
 (C) Copper
 (D) Aluminium
3. An electric bulb can be worked from
- (A) AC supply
 (B) DC supply
 (C) battery supply only
 (D) All of the above
4. Which of the following is an active element of a circuit?
- (A) Resistance
 (B) Inductance
 (C) Capacitance
 (D) Ideal current source
5. If two incandescent light bulbs of 40 W and 60 W ratings are connected in series across the main supply, then
- (A) the bulbs together consume 100 W
 (B) the bulbs together consume 50 W
 (C) the 60 W bulb glows brighter
 (D) the 40 W bulb glows brighter
6. A network has 4 nodes and 3 independent loops. What is the number of branches in the network?
- (A) 6
 (B) 5
 (C) 7
 (D) 8
7. Superposition theorem can be applicable to only
- (A) linear network
 (B) linear bilateral network
 (C) non-linear network
 (D) bilateral network
8. An inductor stores energy in what form?
- (A) Electrostatic field
 (B) Electromagnetic field
 (C) Magnetic field
 (D) Core

9. Kirchhoff's current law at a junction deals with

- (A) conservation of energy
- (B) conservation of charge
- (C) conservation of momentum
- (D) conservation of power

10. Two heaters, rated at 1 kW, 250 V each, are connected in series across a 250 V, 50 Hz AC mains. The total power drawn from the supply would be

- (A) 500 W
- (B) 1000 W
- (C) 250 W
- (D) 2000 W

11. Two electric bulbs rated for same voltage have powers of 200 W and 100 W. If their resistances are respectively R_1 and R_2 , then

- (A) $R_1 = 2R_2$
- (B) $R_2 = 2R_1$
- (C) $R_2 = 4R_1$
- (D) $R_1 = 4R_2$

12. For maximum power transfer theorem, the value of maximum power is

- (A) $P_{\max} = V_{\text{th}}^2 / 2R_{\text{th}}$
- (B) $P_{\max} = V_{\text{th}} / 2R_{\text{th}}$
- (C) $P_{\max} = V_{\text{th}}^2 / 4R_{\text{th}}$
- (D) $P_{\max} = V_{\text{th}}^2 / 4R_{\text{th}}^2$

13. The average power in a pure inductive circuit is

- (A) 0
- (B) VI
- (C) $VI \cos \phi$
- (D) $\sqrt{3} VI \sin \phi$

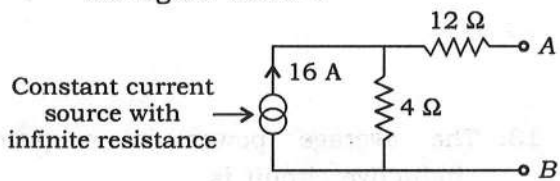
14. When a series R - L circuit is connected to a voltage source V at $t = 0$, the current passing through the inductor L at $t = 0^+$ is

- (A) V/L
- (B) infinite
- (C) V/R
- (D) 0

15. A passive element in a circuit is one which

- (A) supplies energy
- (B) receives energy
- (C) Both supplies and receives energy
- (D) None of the above

16. An ideal voltmeter connected across the terminals *A* and *B* is shown in the figure below :



It will read

- (A) 64 V
- (B) 4 V
- (C) 48 V
- (D) 12 V

17. When a network is loaded by a resistance equal in value to the Norton's resistance, the network current is I_N . The current through the load will be

- (A) $I_N / 4$
- (B) $2I_N$
- (C) $I_N / 2$
- (D) None of the above

18. In parallel *L-C* circuit, what will be the value of current (in ampere) at resonance?

- (A) 0
- (B) 10
- (C) 100
- (D) Infinite

19. What is the correct expression for form factor of a pure sinusoidal signal?

- (A) Product of I_{rms} and I_{avg}
- (B) I_{avg}/I_{rms}
- (C) I_{rms}/I_{avg}
- (D) None of the above

20. For a certain load, the real power is 100 W and the reactive power is 100 VAR. The apparent power is

- (A) 100 VA
- (B) 120 VA
- (C) 141.4 VA
- (D) 250 VA

21. Commutation in a DC machine may be improved by
- reducing the number of turns in the armature and segments of commutator
 - increasing the resistance of brushes
 - neutralizing the reactance voltage by producing a reverse e.m.f. in the coil undergoing commutation
 - All of the above
22. The maximum number of brushes which may be used in an electrical machine is equal to
- number of poles in the machine
 - 2
 - 4
 - Either (A) or (B)
23. _____ DC machines are most common.
- 2-pole
 - 4-pole
 - 6-pole
 - 8-pole
24. The voltage equation of a DC motor is
- $V = V_b + I_a R_a$
 - $V = V_b - I_a R_a$
 - $V = V_b - \frac{1}{2} I_a R_a$
 - $V = V_b + \frac{1}{2} I_a R_a$
25. A separately excited DC generator is **not** used because
- it is costly
 - separate DC source is required for field circuit
 - voltage drops considerably with load
 - None of the above
26. The efficiency of a DC generator is maximum when its variable loss is equal to
- the constant loss
 - half of the constant loss
 - double of the constant loss
 - None of the above
27. The mechanical power developed in a DC motor is maximum when the back e.m.f. (E_b) is equal to _____ of the applied voltage.
- twice
 - half
 - one-third
 - None of the above
28. DC shunt motors are used in those applications where _____ is required.
- high starting torque
 - practically constant speed
 - high no load speed
 - variable speed

29. Which motor should **not** be used for centrifugal pump?

- (A) Shunt
- (B) Series
- (C) Cumulative compound
- (D) Differential compound

30. A 400 kW, 3- ϕ , 440 V, 50 Hz induction motor has a speed of 950 r.p.m. on full load. The motor has 8 poles. The slip of the motor will be

- (A) 0.01
- (B) 0.04
- (C) 0.05
- (D) 0.06

31. What is the primary reason for placing field on rotor in an alternator?

- (A) Small power in the field circuit
- (B) Insulation of high voltage is made easy on stator than on rotor
- (C) Large power in stator
- (D) Large current in stator

32. Slip ring motor is recommended when

- (A) speed control is required
- (B) frequent starting, stopping and reversing are required
- (C) high starting torque is required
- (D) All of the above

33. In case of voltage injection method of speed control, the injected e.m.f. should be of

- (A) $(1-s)f$
- (B) $(2-s)f$
- (C) slip frequency (sf)
- (D) supply frequency (f)

34. Two series motors are mechanically coupled. One machine is run as a motor and other as a generator. The iron and friction losses of the machines will be identical when

- (A) their speeds are identical
- (B) their speeds and excitations are identical
- (C) their speeds are equal but back e.m.f. is the half of the supply voltage
- (D) their rating and armature size are equal

35. A DC series motor is running at rated speed without any additional resistance in series. If an additional resistance is placed in series, then the speed of the motor
- increases
 - decreases
 - remains same
 - None of the above
36. Is it possible to have current in a transmission line under no load condition?
- Yes, because of capacitance effect
 - No, because of proximity effect
 - Yes, because of corona effect
 - Yes, because of skin effect
37. If the AC supply to transformer is replaced by DC, then
- the primary winding will burn
 - the secondary winding will burn
 - the transformer has no effect
 - All of the above
38. A load draws an active power P at a lagging power factor $\cos \phi_1$. If the p.f. is improved to $\cos \phi_2$, then the leading kVAR supplied by p.f. correction equipment will be
- $P(\cos \phi_2 - \cos \phi_1)$
 - $P(\sin \phi_2 - \sin \phi_1)$
 - $P(\tan \phi_1 + \tan \phi_2)$
 - $P(\tan \phi_1 - \tan \phi_2)$
39. In order to reduce the cost of generation of electrical energy, the value of diversity factor (DF) and load factor (LF) should be
- both DF and LF high
 - LF low and DF high
 - LF high and DF low
 - both LF and DF low
40. In a power transformer, the breather is provided in order to
- filter transformer oil
 - prevent ingress of moisture with air
 - provide oxygen to the cooling oil
 - provide fresh air for increasing cooling effect
41. A given amount of power is to be transmitted over a certain distance with fixed power loss. The volume of the copper required (transmission voltage = V , load p.f. = $\cos \phi$) is
- directly proportional to V
 - inversely proportional to V
 - proportional to $(1/V^2 \cos^2 \phi)$
 - proportional to $V^2 \cos^2 \phi$
42. In order to improve p.f. in case of a 3-phase load, the capacitors are connected in
- delta
 - star
 - star or delta
 - None of the above

43. Fleming's left-hand rule is applicable to
- (A) DC generator
 - (B) DC motor
 - (C) alternator
 - (D) transformer
44. The purpose of the conservator in a transformer is
- (A) to cool the winding
 - (B) to prevent moisture in the transformer
 - (C) to prevent short circuit of primary and secondary winding
 - (D) to take up contraction and expansion of oil
45. A magnetic circuit mainly consists of a material having permittivity
- (A) high
 - (B) low
 - (C) medium
 - (D) constant
46. Cogeneration is the simultaneous generation of
- (A) heat and power
 - (B) mechanical energy and power
 - (C) steam and condensate
 - (D) All of the above
47. Hydroelectric power plant is
- (A) non-renewable source of energy
 - (B) conventional source of energy
 - (C) non-conventional source of energy
 - (D) continuous source of energy
48. Load curve helps in deciding
- (A) total installed capacity of plant
 - (B) sizes of the generating units
 - (C) operating schedule of the generating units
 - (D) All of the above
49. A feeder in a transmission system feeds power to
- (A) generation station
 - (B) distributors
 - (C) service mains
 - (D) All of the above
50. The benefit of SCADA in power system is
- (A) improved quality of service
 - (B) improved reliability
 - (C) Both of the above
 - (D) None of the above

51. The equal area criterion of stability is used for

- (A) no load on the busbar
- (B) one machine and infinite busbar
- (C) more than one machine and infinite busbar
- (D) None of the above

52. The transient stability limit of the power system can be increased by introducing

- (A) series inductance
- (B) shunt inductance
- (C) series capacitance
- (D) shunt capacitance

53. The relative permeability of paramagnetic material is

- (A) one
- (B) less than one
- (C) little more than one
- (D) several hundred

54. Which of the following materials is particularly suitable for use in standard resistance coil and instrument shunts?

- (A) Nichrome
- (B) Graphite
- (C) Manganin
- (D) Alnico

55. Polarization P in a solid dielectric is related to the electric field E and electric flux density D by the relation

- (A) $E = P + \epsilon_0 D$
- (B) $D = E + \epsilon_0 P$
- (C) $D = \epsilon_0 E + P$
- (D) $D = \epsilon_0 P + E$

56. The acceptance value of grounding resistance to domestic appliance is

- (A) 0.1Ω
- (B) 1Ω
- (C) 10Ω
- (D) 100Ω

57. An ideal OP-AMP has

- (A) infinite A_v
- (B) infinite R_i
- (C) zero R_o
- (D) All of the above

58. LEDs normally work on a voltage of

- (A) 1 V to 2 V
- (B) 10 V to 20 V
- (C) 50 V to 60 V
- (D) 100 V to 150 V

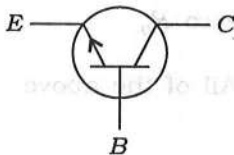
59. The characteristics of thyristor closely resemble to the characteristics of

- (A) $P-N$ junction
- (B) constant voltage source
- (C) constant current source
- (D) thyatron gas tube

60. The Class B push-pull amplifier has the advantage of being free from

- (A) any circuit imbalance
- (B) unwanted noise
- (C) even-order harmonic distortion
- (D) DC magnetic saturation effect

61. The following figure represents a/an



- (A) $N-P-N$ transistor
- (B) $P-N-P$ transistor
- (C) Zener diode
- (D) power diode

62. The instrument used for DC measurement alone is

- (A) moving-iron type
- (B) electrodynamic type
- (C) permanent magnet type
- (D) induction type

63. The difference between the indicated value by an instrument and true value of a variable is called

- (A) dead zone error
- (B) relative error
- (C) static error
- (D) drift error

64. Which of the following instruments consumes the lowest power measurement?

- (A) VTVM
- (B) PMMC instrument
- (C) Electrostatic instrument
- (D) d'Arsonval instrument

65. The phenomenon of creeping occurs in

- (A) ammeter
- (B) energy meter
- (C) wattmeter
- (D) voltmeter

66. CRO is used to measure

- (A) phase
- (B) frequency
- (C) voltage
- (D) All of the above

67. Hay's bridge is particularly suited for measurement of

- (A) capacitance over a wide range of values
- (B) inductance having high Q-value
- (C) capacitance having high Q-value
- (D) inductance having low Q-value

68. The number 1000_2 is equivalent to decimal number

- (A) one thousand
- (B) eight
- (C) four
- (D) sixteen

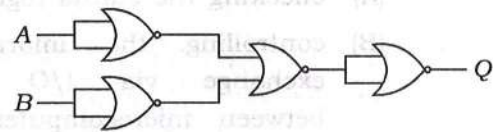
69. The cumulative addition of the four binary bits $(1+1+1+1)$ gives

- (A) 1111
- (B) 111
- (C) 100
- (D) 1001

70. The 2's complement of 1000_2 is

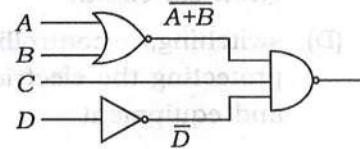
- (A) 1000
- (B) 0001
- (C) 0111
- (D) 0101

71. The output of the logic circuit given below represents _____ gate.



- (A) NAND
- (B) OR
- (C) NOR
- (D) AND

72. Determine the output expression for the circuit shown below :



- (A) $A\bar{B} + C$
- (B) $\overline{(A+B)} \cdot \bar{C}D$
- (C) $AB + C$
- (D) $AB + D$

73. Microprocessor 8085 is the enhanced version of _____ with essentially the same construction set.
- (A) 6800
(B) 68000
(C) 8080
(D) 8000
74. In computer parlance, 'handshaking' means
- (A) checking the status register
(B) controlling the information exchange via I/O ports between microcomputer and external logic
(C) data transmission by external logic to I/O port
(D) reading I/O port data by a microprocessor
75. Switchgear is a device used for
- (A) interrupting an electrical circuit
(B) switching an electrical circuit
(C) switching and controlling an electrical circuit
(D) switching, controlling and protecting the electrical circuit and equipment
76. An isolator is installed
- (A) to operate the relay of the circuit breaker (CB)
(B) as a substitute for CB
(C) always independent of the position of CB
(D) generally on both sides of a CB
77. Resistance grounding is used for voltage between
- (A) 33 kV to 66 kV
(B) 11 kV to 33 kV
(C) 3.3 kV to 11 kV
(D) None of the above
78. No ceiling fan should be installed at the height of less than
- (A) 2.5 m from the floor
(B) 5.5 m from the floor
(C) 4.5 m from the floor
(D) 3.5 m from the floor
79. The frequencies and voltage used in dielectric heating are
- (A) 10 MHz–30 MHz up to 25 kV
(B) 50 MHz–60 MHz up to 25 kV
(C) 10 MHz–30 MHz up to 100 V
(D) 50 MHz–60 MHz up to 230 V
80. The loads on 3-phase, 4-wire distributor are usually
- (A) balanced
(B) unbalanced
(C) either balanced or unbalanced
(D) None of the above

81. When the length of cable increases, its capacitance

- (A) decreases
- (B) increases
- (C) remains same
- (D) None of the above

82. A wattmeter measures _____ power.

- (A) instantaneous
- (B) apparent
- (C) reactive
- (D) average

83. 8085 is capable of addressing _____ of memory.

- (A) 8K
- (B) 16K
- (C) 24K
- (D) 64K

84. How many buses are connected as a part of 8085 microprocessor?

- (A) 2
- (B) 3
- (C) 5
- (D) 8

85. The material used for fuse must have

- (A) low melting point and high specific resistance
- (B) low melting point and low specific resistance
- (C) high melting point and low specific resistance
- (D) low melting point and any specific resistance

86. Which IE rule is applicable to service mains?

- (A) Rule 30
- (B) Rule 33
- (C) Rule 77
- (D) All of the above

87. Which among the following fuses is very fast in operation?

- (A) Semiconductor fuse
- (B) High rupturing capacity fuse
- (C) Kit Kat fuse
- (D) Cartridge fuse

88. Steel rail poles of height 13 meters are used for transmission purpose of _____ voltage.

(A) 33 kV

(B) 11 kV

(C) 22 kV

(D) Both (A) and (B)

89. On which of the following, routine tests are conducted?

(A) Oil circuit breakers (CBs)

(B) Air blast CBs

(C) Minimum oil CBs

(D) All of the above

90. Which among the following is a commissioning check during site testing for an induction motor?

(A) Insulation resistance

(B) Terminal shrouds

(C) Heater supply

(D) All of the above

91. In monthly maintenance of storage batteries, which activity is performed?

(A) Voltages

(B) Cleaning

(C) Terminals

(D) All of the above

92. In annually inspection, which is mainly inspected in less than 100 kVA transformer?

(A) Fire system

(B) Core

(C) Coil

(D) Oil

93. In annually inspection, which is mainly inspected in overhead line?

(A) Insulation

(B) Tower

(C) Earth wire

(D) All of the above

94. Which of the following is *not* a type of electric resistance welding?

(A) Butt welding

(B) Seam welding

(C) Helium welding

(D) Spot welding

95. Biogas mainly consists of

- (A) fossil
- (B) cow dung
- (C) petroleum
- (D) All of the above

96. Which of the following is a conventional source of energy derived from decayed plant and animal remains?

- (A) Wind
- (B) Geothermal
- (C) Solar
- (D) Coal

97. Which non-conventional source of energy involves tapping into the Earth's internal heat for power generation?

- (A) Solar energy
- (B) Wind energy
- (C) Geothermal energy
- (D) Tidal energy

98. For any medium, electric flux density D and electric intensity E are related as

- (A) $D = \epsilon_0 E$
- (B) $D = \epsilon_0 / E$
- (C) $D = E / \epsilon_0 \epsilon_r$
- (D) $D = \epsilon_0 \epsilon_r E$

99. Most of single-phase induction motors are _____ machines.

- (A) 2-pole
- (B) 6-pole
- (C) 8-pole
- (D) 4-pole

100. A synchronous motor delivers reactive power when

- (A) over-excited
- (B) under-excited
- (C) normally excited
- (D) None of the above

SPACE FOR ROUGH WORK

98. In a series R-L circuit, the voltage across the resistor is 60 V and the voltage across the inductor is 80 V. The total voltage across the series combination is

- (A) 100 V
- (B) 140 V
- (C) 20 V
- (D) 200 V

99. A series R-L circuit is connected to an AC source. The voltage across the resistor is 60 V and the voltage across the inductor is 80 V. The total voltage across the series combination is

- (A) 100 V
- (B) 140 V
- (C) 20 V
- (D) 200 V

100. A synchronous motor delivers 100 kW of mechanical power. The motor is over-excited. The power factor of the motor is

- (A) 0.8 leading
- (B) 0.8 lagging
- (C) 0.8 unity
- (D) 0.8 leading

SEAL