N **Booklet Code : D**

Note: **(1)** Answer all questions.

(2) Each question carries 1 mark. There are no negative marks.

(3) Answer to the questions must be entered only on OMR Answer Sheet provided separately by Completely shading with **Ball Point Pen (Black) only.**

(4) The OMR Answer Sheet will be invalidated if the circle is shaded using Pencil or if more than one circle is shaded against each question.

Section A : Electrical Engineering

1. The main criterion for selection of the size of a radial distribution system is
   (1) voltage drop (2) corona loss
   (3) temperature rise (4) capital cost

2. The insulation resistance of a cable of length 10 km is 1 M Ω. For a length of 100 km of the same cable, the insulation resistance will be
   (1) 1 M Ω (2) 10 M Ω
   (3) 0.1 M Ω (4) 0.01 M Ω

3. For a 500 Hz frequency excitation, a 50 km long power line will be modeled as
   (1) short line (2) medium line
   (3) long line (4) data insufficient for decision

4. Series capacitive compensation in EHV transmission line is used to
   (1) reduce the line loading (2) improve the stability of the system
   (3) reduce the voltage profile (4) improve the protection of the line

5. The corona loss on a particular system at 50 Hz is 1 kW/km per phase, the corona loss at 60 Hz would be
   (1) 1kW per km per phase (2) 0.83kW per km per phase
   (3) 0.088kW per km per phase (4) 0.88kW per km per phase

6. The severity of line-to-ground and three-phase faults at the terminals of unloaded synchronous generator is to be same. If the terminal voltage is 1.0 pu and zl = z2 = j0. 1pu, z0 = j0.05 pu for the alternator, then the required inductive reactance for neutral grounding is
   (1) 0.0166 pu (2) 0.05 pu
   (3) 0.1 pu (4) 0.15 pu

7. Buses for load flow studies are classified as
   a. the load bus
   b. the generator bus
   c. the slack bus

   The correct combination of the pair of quantities specified having their usual meaning for different buses is

	Load bus	Generator bus	Slack bus
(1)	P, |V|	P, Q	P, δ
(2)	P, Q	P, |V|	|V| δ
(3)	|V|, Q	P, δ	P, Q
(4)	P, δ	Q, |V|	Q, δ

8. The incremental fuel cost for two generating units given by
   $IC_1 = 25 + 0.2\,PG_1$
   $IC_2 = 32 + 0.2\,PG_2$
   Where PG_1 and PG_2 are real power generated by the units.
   The economic allocation for a total load of 250 MW, neglecting transmission loss is given by:
   (1) $PG_1 = 140.25$ MW; $PG_2 = 109.75$ MW
   (2) $PG_1 = 109.75$ MW; $PG_2 = 140.75$ MW
   (3) $PG_1 = PG_2 + 125$ MW
   (4) $PG_1 = 100$ MW; $PG_2 + 150$ MW

9. The most appropriate operating speed in rpm of the generator used in Thermal, Nuclear and Hydro-power plants would respectively be
   (1) 3000, 3000 and 1500
   (2) 3000, 3000 and 300
   (3) 1500, 1500 and 3000
   (4) 1000, 900 and 750

10. A large AC generator, supplying power to an infinite bus, has a sudden short-circuit occurring at its terminals. Assuming the prime mover input and the voltage behind the transient reactance to remain constant immediately after the fault, acceleration of the generator rotor is
   (1) inversely proportional to the moment of inertia of the machine
   (2) inversely proportional to the square of the voltage
   (3) directly proportional to the square of the short circuit current
   (4) directly proportional to the short circuit power

11. If in a short transmission line, resistance and inductance are found to be equal and regulation appears to be zero, then the load will
   (1) have unity power factor
   (2) have zero power factor
   (3) be 0.707 leading
   (4) be 0.707 lagging

12. Steady-state stability of a power systems is improved by
(1) reducing fault clearing time
(2) using double circuit line instead of single circuit line
(3) single pole switching
(4) decreasing generator inertia

13. During a disturbance on a synchronous machine, the rotor swings form A to B before finally setting down to steady state at point C on the power angle curve. The speed of the machine during oscillation is synchronous at point(s)
(1) A and B (2) A and C (3) B and C (4) only at C

14. If the fault current is 2000 A, the relay setting is 50% and CT ratio is 400:5, the plug setting multiplier will be
(1) 25 A (2) 1 A (3) 50 A (4) 10 A

15. Reactance relay is normally preferred for protection against
(1) earth faults
(2) phase faults
(3) open-circuit fault
(4) all types of faults

16. Which of the following statements is true?
(1) steady-state stability limit is greater than transient stability limit
(2) steady-state stability limit is equal to transient stability limit
(3) steady-state stability limit is less than the transient stability limit
(4) no generalization can be made regarding the equality or otherwise of the steady-state stability limit and transient stability limit

17. To prevent mal-operation of differentially connected relay while energizing a transformer, the relay restraining coil is based with
(1) second harmonic current
(2) third harmonic current
(3) fifth harmonic current
(4) seventh harmonic current

18. A lightening arrester connected between the line and earth in a power system
(1) protects the terminal equipment against travelling surges
(2) protects the transmission line against direct lightening strokes
(3) suppresses high frequency oscillations in the line
(4) reflects back the travelling wave approaching it

19. Equal area criterion gives the information regarding
(1) stability region
(2) absolute stability
(3) relative stability
(4) swing curves

20. The storage battery generally used in electric power stations is
(1) zinc carbon battery
(2) lead acid battery
(3) nickel cadmium battery
(4) lithium-ion battery

21. In a self-controlled synchronous motor fed from a variable frequency invertor
(1) the rotor poles invariably have damper windings
(2) there are stability problems
(3) the speed of the rotor decides stator frequency
(4) the frequency of the stator decides the rotor speed

22. In a synchronous generator delivering lagging power factor load
(1) the excitation emf leads terminal voltage by the power angle
(2) the excitation emf lags terminal voltage by the power angle
(3) excitation emf leads the terminal voltage by the power factor angle
(4) excitation emf lags the terminal voltage by the power factor angle

23. The reduced form of the Boolean expression $A\left[B+C\left(\overline{AB+AC}\right)\right]$ is
(1) $\overline{A}B$ (2) $A\,\overline{B}$ (3) AB (4) $AB+B\overline{C}$

24. If stability error for step input and speed of response be the criteria for design, what controller would you recommend
(1) P controller
(2) PD controller
(3) PI controller
(4) PID controller

25. Which of the following theorems enables a number of voltage (or current) source to be combined directly into a single voltage (or current) source.
(1) compensation theorem
(2) reciprocity theorem
(3) superposition theorem
(4) Millman's theorem

26. The load on the power plant w.r.t time for 24 Hr are given as

Time (Hr)	0–6	6–8	8–12	12–14	14–18	18–22	22–24
Load (MW)	40	50	60	50	70	80	40

The load factor of power station is as
(1) 0.75 (2) 0.71 (3) 0.60 (4) 0.68

27. Power station having Load factor = 70%, capacity factor = 50%, used factor = 60%, maximum demand = 20MW then annual energy production is
(1) 122.8 GWh
(2) 198.55 GWh
(3) 128.2 GWh
(4) 188.82 GWh

28. Boiler rating is usually defined in terms of
(1) Maximum temperature of steam in Kelvin
(2) Heat transfer rate in KJ/hr
(3) Heat transfer area in metre^2
(4) Steam output in kg/hr

29. When inspection doors on the walls of boilers are opened, flame does not leap out because
(1) These holes are small
(2) Pressure inside is negative
(3) Flame travels always in the direction of flow
(4) These holes are located beyond the furnace

30. The use of regenerator in a gas turbine cycle
(1) increases efficiency but has no effect on output
(2) increases output but has no effect on efficiency
(3) increases both efficiency and output
(4) increases efficiency but decreases output

31. Reheating in a gas turbine
(1) increases the compressor work
(2) decreases the compressor work
(3) increases the turbine work
(4) decreases the turbine work

32. In steam turbine terminology, diaphragm refers to
(1) separating wall between rotors carrying nozzles
(2) the ring of guide blades between rotors
(3) a partition between low and high pressure sides
(4) the flange connecting the turbine exit to the condenser

33. In hydroelectric power plants
(1) both operating and initial cost are high
(2) both operating and initial cost are low
(3) operating cost is low and initial cost is high
(4) operating cost is high and initial cost is low

34. The function of a surge tank is to
(1) produce surge in the pipeline
(2) relieve water hammer pressure in the penstock
(3) supply water at constant pressure
(4) none of above

35. The rankine cycle efficiency of steam power plant is
(1) 60–80% (2) 45–80%
(3) 30–45% (4) 20–30%

36. In a series RLC high Q circuit, the current peaks at a frequency
(1) equal to the resonant frequency (2) greater than the resonant frequency
(3) less than the resonant frequency (4) equal to half the resonant frequency

37. Two port networks are connected in cascade. The parameters of the network are obtained by multiplying in individual
(1) z-parameter matrix (2) h-parameter matrix
(3) y-parameter matrix (4) ABCD parameter matrix

38. The necessary and sufficient condition for a rational function of, T(s) to be driving point impedance of an RC network is that all poles and zeros should be
(1) simple and lie on the negative axis in the s-plane
(2) complex and lie in the left of the s-plane
(3) complex and lie in the right of the s-plane
(4) simple and lie on the positive real axis of the s-plane

39. A network contains linear resistors and ideal voltage sources. If values of all the resistors are doubled, then the voltage across each resistor will
(1) become half (2) become double
(3) increase by four times (4) not change

40. The number of independent loops for a network with n nodes and b branches is
(1) $n-1$ (2) $b-n$
(3) $b-n+1$ (4) independent of the number of nodes

41. A DC voltage source is connected across a series RLC circuit. Under steady-state conditions, the applied DC voltage drops entirely across the
(1) R only (2) L only (3) C only (4) R and L combination

42. An electromechanical close-loop control system has the following characteristic equation
$S^3+6KS^2+(K+2)S+8=0$
Where K is the forward gain of the system. The condition for closed loop stability is:
(1) $K=0.528$ (2) $K=2$ (3) $K=0$ (4) $K=-2528$

43. A linear time-invariant system is described by the state variable model

$$\begin{pmatrix} x'_1 \\ x'_2 \end{pmatrix} \begin{pmatrix} -1 & 0 \\ 0 & -2 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} u$$

$$c(t) = (1 \quad 2) \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

(1) the system is completely controllable (2) the system is not completely controllable
(3) the system is completely observable (4) the system is not completely observable

44. The gain margin for the system with open-loop transfer function $G(s)H(s) = \frac{2(1+s)}{s^2}$ is

(1) ∞ (2) 0 (3) 1 (4) $-\infty$

45. Consider a second order system whose state space representation is of the form

$X' = AX + Bu$

If $x_1(t) = x_2(t)$, the system is

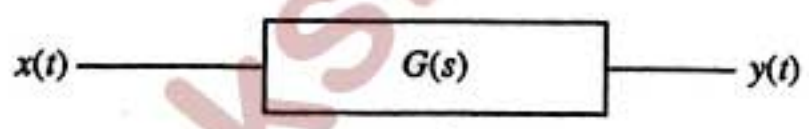
(1) controllable (2) uncontrollable (3) observable (4) unstable

46. The transfer function for the state variable representation

$X' = AX + Bu$, $Y = VX + Du$, is given by

(1) $D+C(SI-A)^{-1}B$ (2) $B(SI-A)^{-1}C+D$
(3) $D(SI-A)^{-1}B+C$ (4) $C(SI-A)^{-1}D+B$

47. A linear stable time-invariant system is forced with an input $x(t) = A \sin \omega t$ Under steady-state conditions, the output $y(t)$ of the system will be



(1) $A \sin(\omega t+\phi)$, where $\phi = \tan^{-1} G|(j\omega)|$
(2) $|G(j\omega)| A \sin[\omega t + \angle G(j\omega)]$
(3) $|G(j\omega)| A \sin[2\omega t + \angle G(j\omega)]$
(4) $AG(j\omega) \sin G[\omega j = \angle G(j\omega)]$

48. An unshielded moving iron voltmeter is used to measure the voltage in an AC circuit. The stray DC magnetic field having a component along the axis will be

(1) unaffected
(2) decreased
(3) increased
(4) either decreased or increased depending on the direction of the DC field

49. The DC voltmeter has sensitivity of 1000 Ω per Volt. When it measures half full scale in 100 V range, the current through the voltmeter is
(1) 100 mA (2) 1 mA (3) 0.5 mA (4) 50 mA

50. A moving coil of meter has 100 turns, and a length and depth of 10mm and 20mm respectively. It is positioned in a uniform radial flux density of 200 mT. The coil carrier current capacity is 50 mA. The torque on the coil is
(1) 200 μNm (2) 100 μNm (3) 2 μNm (4) 1 μNm

51. In an experiment with a thermocouple with one junction at 0°C, the following data were obtained at 0°C :

θ°C	20°C	100°C	300°C
E (in millivolts)	0.194	0.850	1.650

Assuming parabolic relation, the calculated neutral temperature for this thermocouple will be about
(1) 300°C (2) 333°C (3) 366°C (4) 399°C

52. A moving coil ammeter has a fixed shunt of 0.02 Ohm resistance. If the coil resistance of the meter is 1000 Ohms, a potential difference of 500 mV is required across it for full-scale deflection. Under this condition, the current in the shunt would be
(1) 2.5A (2) 25A (3) 0.25A (4) 0.025A

53. Measurement of a non-electrical quantity involves the following four subsystems:
a) amplifier block b) display block
c) instrumentation block d) transducer block
The correct, sequence in which these block occur is
(1) d, a, c, b (2) d, c, a, b (3) a, c, b, d (4) a, b, c, d

54. The equivalent series resistance of a capacitor C in terms of its power factor and operation frequency f is given by
(1) power factor / $2\pi fC$ (2) $2\pi fC$ / power factor
(3) $2\pi fC$ (power factor) (4) $1/2\pi fC$ (power factor)

55. Piezoelectric Transducer is used to measure
(1) displacement (2) resistance (3) current (4) temperature

56. Two non-inverting amplifiers, one having a unity gain and the other having a gain of twenty are made using identical operational amplifiers. As compared to the unity gain amplifier, the amplifier with gain twenty has
(1) less negative feedback (2) greater input impedance
(3) less bandwidth (4) more bandwidth

57. Two identical FETs, each characterized by the parameters g_m and r_d are connected in parallel. The composite FET is then characterized by the parameters.
(1) $g_m/2$ and $2r_d$ (2) $g_m/2$ and $r_d/2$ (3) $2g_m$ and $r_d/2$ (4) $2g_m$ and $2r_d$

58. SCR is more utilized as compared to Triac because it is
(1) more capable in regard to control (2) more efficient
(3) available with higher ratings (4) comparatively cheaper

59. A 4 bit modulo-16 ripple counter users JK flip-flop. If the progression delay of each flip-flop is 50 ns, the maximum clock frequency that can be used is equal to :
(1) 20 MHz (2) 10 MHz (3) 5 MHz (4) 4 MHz

60. A 10-bit ADC with a full scale output voltage of 10.24 V is designed to have a ± LSB/2 accuracy. If the ADC is calibrated at 25°C and the operating temperature ranges from 0°C to 50°C. Then the maximum net temperature coefficient of the ADC should not exceed.
(1) ± 200μV/°C (2) ± 400μV/°C (3) ± 600μV/°C (4) ± 800μV/°C

61. The minimum number of 2-input NAND gates required to implement the Boolean function Z = A B' C, assuming that A, B and C are available is
(1) two (2) three (3) five (4) six

62. The core of a transformer is made of
(1) silicon steel (2) annealed copper
(3) seasoned wood (4) aluminum

63. The core of a transformer is assembled with laminated sheets to reduce
(1) hysteresis loss (2) eddy-current loss
(3) magnetic noise (4) magnetizing current

64. The emf induced in the secondary winding of a 50Hz single-phase transformer having 1000 turns on its secondary is 222 V. The maximum flux density in the core is 0.1 Wb/m^2. The cross-sectional area of the core is
(1) 0.1 m^2 (2) 0.01 m^2 (3) 1 m^2 (4) 0.001 m^2

65. An additional condition for paralled operation of three-phase transformers over single-phase transformers is that
(1) the transformers should belong to the same vector group
(2) ratios of the winding resistances to resistances for the transformers should be equal
(3) the transformers should have the same kVA ratings
(4) the transformers should not belong to the same vector group

66. In a dc machine, interpoles are used to
(1) neutralize the effect of armature reaction in the interpolar region
(2) generate more induced emf in the armature
(3) avoid interference of the armature flux with the main-field flux
(4) reduce the demagnetizing effect of armature reaction

67. The function of a brush and commutator arrangement in a dc motor is to
(1) produce unidirectional torque
(2) produce unidirectional current in the armature
(3) help in changing the direction of rotation of the armature
(4) reduce sparking

68. Aluminium is not used as winding wire for the armature of a dc machine because
(1) aluminium has low resistivity
(2) a large winding space is taken by aluminium conductors and creates jointing problems
(3) the thermal conductivity of aluminium is low
(4) aluminium has low conductivity as compared to copper

69. The induced emf in the armature of a lap-wound four-pole dc machine having 100 armature conductors rotating at 600 rpm and with 1 Wb flux per pole is
(1) 1000V (2) 100V (3) 600V (4) 10,000V

70. A 400 V, 50 Hz three-phase induction motor rotates at 1440 rpm on full-load. The motor is wound for
(1) 2 poles (2) 4 poles (3) 6 poles (4) 8 poles

71. The slip of 400 V, three phase, 4-pole induction motor when rotating at 1440 rpm is
(1) 2 percent (2) 3 percent
(3) 4 percent (4) 5 percent

72. Torque developed by a three-phase, 400V, induction motor is 100 N-m. If the applied voltage is reduced to 200-V, the developed torque will be
(1) 50 N-m (2) 25 N-m (3) 200 N-m (4) 62.5 N-m

73. A delta-connected 400 V, 50 Hz, three-phase induction motor when started direct-on-line takes a starting current of 30 A. When the motor is started through star-delta starter, the starting current will be
(1) 3A (2) 10A (3) 15A (4) 30A

74. Stepper motors are used in
(1) printers (2) lifts (3) amplifiers (4) oscillators

75. In a thyristor DC chopper, which type of commutation results in best performance?
(1) voltage commutation
(2) current commutation
(3) load commutation
(4) supply commutation

76. When the firing angle α of a single-phase, fully controlled rectifier feeding constant direct current into a load is 30°, the displacement power factor of the rectifier is
(1) 1
(2) 0.5
(3) $1\sqrt{3}$
(4) $\sqrt{3}/2$

77. A 3-phase, fully controlled, converter is feeding power into a DC load at a constant current of 150 A, the rms value of the current flowing through each thyristor of the converter is
(1) 50A
(2) 100A
(3) $\frac{150\sqrt{2}}{\sqrt{3}}$
(4) $\frac{150}{\sqrt{3}}$

78. A single-phase voltage source square-wave inverter feeds pure inductive load. The waveform of the load current will be
(1) sinusoidal
(2) rectangular
(3) trapezoidal
(4) triangular

79. A voltage source inverter is normally employed when
(1) source inductance is large and load inductance is small
(2) source inductance is small and load inductance is large
(3) both source and load inductance are small
(4) both source and load inductance are large

80. In order to have a lower cost of electrical energy generation the load factor
(1) and the diversity factor should be low
(2) should be low but the diversity factor should be high
(3) should be high but the diversity factor should be low
(4) and the diversity factor both should be high

Section B : General Awareness and Numerical Ability

81. Best Hindi Film award in the 62nd National Film Awards has been given to _____?
(1) Happy New Year (2) Queen
(3) Highway (4) Veer Zaara

82. Dronacharya Award is given for excellence in the field of -
(1) literary work (2) social service
(3) coaching in sport (4) winners of Olympics

83. Which of the following is used in pencil?
(1) graphite (2) charcoal (3) silicon (4) phosphorous

84. You could tell the time by he because he always _____ work at exactly the same time every day.
(1) ends (2) ended (3) finish (4) finishes

85. Which is the correct expression?
(1) Joe's the person with who I am angry (2) Joe's the person with whom I am angry
(3) Joe's the person I am angry on (4) Joe's the person who I am angry

86. Which sentence uses the present tense correctly?
(1) Look, it rains (2) No, I am not listening you
(3) I'm playing cricket every Thursday (4) She works for a bank

87. The manager was terrified that his employees would stop work and walk _____ without warning.
(1) over (2) about (3) out (4) at

88. Name the author of 'Basavapuranam'.
(1) Palkuri somanath (2) Vallabharaya
(3) Sreenatha (4) Jayapa

89. Who built the famous 'Ramappa temple' located at Palampet.
(1) Recherla Venna (2) Recherla Prasaditys
(3) Recherla Mallanna (4) Recherla Rudra

90. Identify the Peshwa and famous engineer of Muhammad Quli-Qutub Shah, who has designed the plan of Hyderabad.
(1) Mir-khadir (2) Mir-Muneer
(3) Mir-Momin-Astrabadi (4) Gawan

91. What is the standard '**currency**' of Golconda kingdom.
(1) Honnu (2) Paisa (3) Dinar (4) Halisikka

92. Which of the following programming languages are considered as low level language?
(1) BASIC, COBOL, Fortran (2) C, C++
(3) Assembly language (4) Prolog

93. Basic building blocks for a digital circuit is
(1) CMOS (2) DMOS (3) BIOS (4) Logic gates

94. A digital signature is
(1) a bit string giving identity of a correspondent
(2) a unique identification of a sender
(3) an authentication of an electronic record by tying it uniquely to a key only a sender knows
(4) an encrypted signature of a sender

95. Which of the following is not functionally a complete set?
(1) AND, OR (2) NAND (3) NOR (4) NOT, AND, OR

96. Find the remainder when 2^{31} is divided by 7
(1) 3 (2) 1 (3) 5 (4) 2

97. A bottle of ink was $\frac{2}{3}$ full. When 7 pens were filled with ink from the bottle and 2 pens full of ink was poured into it, it was $\frac{1}{4}$ full. How many pens can be filled with the full bottle of ink?
(1) 12 (2) 14 (3) 8 (4) 16

98. The average of 7 numbers is 28. The average of first two numbers is $12\frac{1}{2}$ and that of the next three is $16\frac{1}{3}$. If the sixth number is less than the seventh number by 5, then the seventh number is
(1) 84 (2) 72 (3) 59 (4) 63

99. The ratio of the ages of a man and his wife is 5:3. After 5 years, this ratio will be 3:2. If at the time of marriage, the ratio was 1:2, then how many years ago were they married?
(1) 12 (2) 18 (3) 26 (4) 32

100. Air Marshal ___ is appointed as the new chief of Western Air Command of Indian Air Force?
(1) S.B. Deo (2) Rohit Nandan
(3) K. Vijay Raghvan (4) Devendra Chaudhry