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

Test Booklet No. : **Series**

TEST BOOKLET

A

00565

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 :

   Ⓐ Ⓑ Ⓒ Ⓓ

   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 :

   Ⓐ Ⓑ ● Ⓓ

   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 (20) 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.

[No. of Questions : 100

SEAL

1. Floating battery systems are widely used for

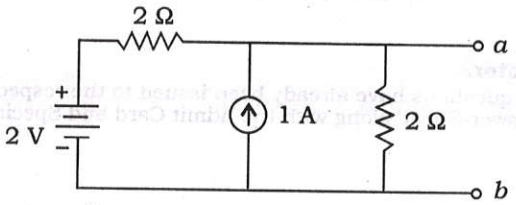
(A) power station

(B) emergency lighting

(C) telephone exchange installation

(D) All of the above

2. The Thevenin voltage and resistance of the given circuit seen from terminals a and b are



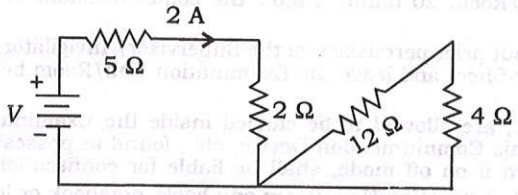
(A) 2 V and 1 Ω

(B) 4 V and 1 Ω

(C) $\frac{1}{2}$ V and 1 Ω

(D) 1 V and 2 Ω

3. In the given circuit, the value of V is equal to



(A) 10 V

(B) 0 V

(C) 14 V

(D) 12 V

4. The Thevenin equivalent of a circuit operating at $\omega = 5$ rad/s has

$$V_{oc} = 3 \cdot 7 \angle -15 \cdot 9^\circ \text{ V}$$

$$Z_0 = 2 \cdot 8 + j0 \cdot 67 \ \Omega$$

At this frequency, the minimal realization of the Thevenin impedance will have

(A) a resistor, a capacitor and an inductor

(B) a resistor and a capacitor

(C) a resistor and an inductor

(D) a capacitor and an inductor

5. A complex current wave is given by $i = 5 + 5\sin 100\pi t$ A. The average value will be

(A) 10 A (B) 0 A

(C) $\sqrt{50}$ A (D) 5 A

6. A resistance of 5 Ω is connected in a branch of a network. The current in this branch is 2 A. If this 5 Ω resistor is replaced by a 10 Ω resistor, the current in the branch

(A) may be more or less than 2 A

(B) will be more than 2 A

(C) will be less than 2 A

(D) will be 2 A

7. Two incandescent lightbulbs of 40 W and 60 W rating are connected in series across the mains. 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

8. A practical current source is usually represented by

(A) a resistance in series with an ideal current source

(B) a resistance in parallel with an ideal current source

(C) a resistance in parallel with an ideal voltage source

(D) None of the above

9. A dead storage battery can be revived by

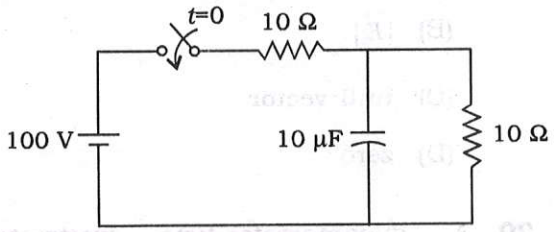
(A) a dose of H_2SO_4

(B) adding so-called battery restorer

(C) adding distilled water

(D) None of the above

10. In the given circuit, the initial capacitor voltage is zero. The switch is closed at $t = 0$. The final steady-state voltage across the capacitor is



(A) 100 V

(B) 50 V

(C) 25 V

(D) 0 V

11. A circuit with resistor, inductor and capacitor in series is resonant at f_0 Hz. If all the component values are now halved, the new resonant frequency is

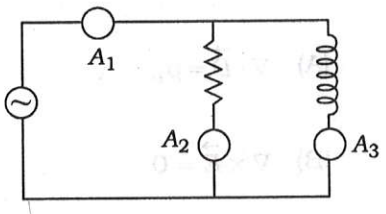
(A) $2f_0$ Hz

(B) still f_0 Hz

(C) $(f_0/4)$ Hz

(D) $(f_0/2)$ Hz

12. In the given circuit, ammeter A_2 reads 4 A and A_3 reads 3 A. Then A_1 will read



(A) 7 A

(B) 1 A

(C) 4 A

(D) 5 A

13. Given two coupled inductors L_1 and L_2, their mutual inductance M satisfies

(A) $M = \sqrt{L_1^2 + L_2^2}$

(B) $M > \frac{L_1 + L_2}{2}$

(C) $M > \sqrt{L_1 L_2}$

(D) $M \leq \sqrt{L_1 L_2}$

14. The electric field strength between two charges $-5Q$ and $+2Q$ separated by 50 cm is zero

(A) at midway between them

(B) at perpendicular bisector

(C) beyond the positive charge

(D) beyond the negative charge

15. Identify the Maxwell's equation from the following.

(A) $\nabla \cdot \vec{D} = \rho_v$

(B) $\nabla \times \vec{E} = 0$

(C) $\oint \vec{E} \cdot d\vec{l} = 0$

(D) All of the above

16. A single-phase diode bridge rectifier supplies a highly inductive load. The load current can be assumed to be ripple free. The a.c. supply side current waveform will be

(A) sinusoidal

(B) constant d.c.

(C) square

(D) triangular

17. Which of the following statements holds true for divergence of electric and magnetic flux densities?

(A) Both are zero.

(B) They are zero for static densities but non-zero for time-varying densities.

(C) It is zero for the electric flux density.

(D) It is zero for the magnetic flux density.

18. In a uniform electric field, the field lines at equipotential surfaces

(A) are parallel to one another

(B) intersect at 45°

(C) intersect at 30°

(D) are orthogonal

19. If $\vec{E}$ is the electric field intensity, then $\nabla \cdot (\nabla \times \vec{E})$ is equal to

(A) $\vec{E}$

(B) $|\vec{E}|$

(C) null vector

(D) zero

20. A dynamometer-type wattmeter responds to the

(A) average value of active power

(B) average value of reactive power

(C) peak value of active power

(D) peak value of reactive power

21. The two-wattmeter method is used to measure active power on a 3-phase, 3-wire system. If the phase voltage is unbalanced, then the power reading is

(A) affected by both negative sequence and zero sequence voltages

(B) affected by negative sequence voltage but not by zero sequence voltage

(C) affected by zero sequence voltage but not by negative sequence voltage

(D) not affected by negative or zero sequence voltage

22. A pressure gauge is calibrated from 0–50 kN/m^2. It has a uniform scale with 100 scale divisions. One-fifth of the scale divisions can be read with certainty. The gauge has

(A) resolution of 0·1 kN/m^2

(B) threshold of 0·1 kN/m^2

(C) dead zone of 0·2 kN/m^2

(D) resolution of 0·5 kN/m^2

23. A Wheatstone bridge is balanced with all the four resistances equal to 1 kΩ each. The bridge supply voltage is 100 V. The value of one of the resistances is changed to 1010 Ω. The output voltage is measured with a voltage-measuring device of infinite resistance. The bridge sensitivity is

(A) 10 V/Ω

(B) 2·5 mV/Ω

(C) 25 mV/Ω

(D) None of the above

24. A moving-coil instrument gives a full-scale deflection with a current of 40 μA, while the internal resistance of the meter is 500 Ω. It is to be used as a voltmeter to measure a voltage range of 0–10 V. The multiplier resistance needed is equal to

(A) 2498·5 kΩ

(B) 2400 kΩ

(C) 500 kΩ

(D) 1000 kΩ

25. The current passing through a 10 Ω resistor is given by

$$i = 3 + 4\sqrt{2}\sin 314t \text{ A}$$

This current is measured by a PMMC meter. The measured value is

(A) 3 A

(B) 5 A

(C) 4 A

(D) $4\sqrt{2}$ A

26. In 2's complement representation, the number 11100101 represents the decimal number

(A) +31

(B) −31

(C) +27

(D) −27

27. For the minterm designation $Y = \sum m(1, 3, 5, 7)$, the complete expression is

(A) $Y = \overline{A}\,\overline{B}C + \overline{A}BC$

(B) $Y = \overline{A}\overline{B}C + \overline{A}BC + A\overline{B}C + ABC$

(C) $Y = \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}BC + A\overline{B}C$

(D) $Y = \overline{A}\overline{B}\overline{C} + ABC + \overline{A}\overline{B}C + A\overline{B}C$

28. De Morgan's second theorem is

(A) $A \cdot \overline{A} = 0$

(B) $\overline{\overline{A}} = A$

(C) $\overline{A + B} = \overline{A} \cdot \overline{B}$

(D) $\overline{AB} = \overline{A} + \overline{B}$

29. Two 16 : 1 multiplexers and one 2 : 1 multiplexer can be connected to form a/an

(A) 16 : 1 multiplexer

(B) 32 : 1 multiplexer

(C) 64 : 1 multiplexer

(D) 8 : 1 multiplexer

30. An SCR is considered to be a semi-controlled device because

(A) it can be turned OFF but not ON with a gate pulse

(B) it conducts only during one half cycle of an alternating current wave

(C) it can be turned ON but not OFF with a gate pulse

(D) it can be turned ON only during one half cycle of an alternating voltage wave

31. The bridge method commonly used for finding mutual inductance is

(A) Heaviside-Campbell bridge

(B) Schering bridge

(C) De Sauty bridge

(D) Wien bridge

32. The typical ratio of holding current to latching current in a 20 A thyristor is

(A) 5

(B) 2

(C) 1

(D) 0·5

33. A 3-phase full converter operates at 50 Hz. The ripple frequency in the output voltage is

(A) 50 Hz

(B) 100 Hz

(C) 150 Hz

(D) 300 Hz

34. Consider the function

$$F(s) = \frac{5}{s(s^2 + 3s + 2)}$$

where $F(s)$ is the Laplace transform of the function $f(t)$. The initial value of $f(t)$ is equal to

(A) 5

(B) 5/2

(C) 5/3

(D) 0

35. The characteristic equation of a system is given by

$$3s^4 + 10s^3 + 5s^2 + 2 = 0$$

This system is

(A) unstable

(B) marginally stable

(C) stable

(D) linear

36. Signal flow graph is used to obtain

(A) the stability of a system

(B) the controllability of a system

(C) both stability and controllability of a system

(D) the transfer function of a system

37. The principles of homogeneity and superposition are applied to

(A) linear time-invariant systems

(B) non-linear time-invariant systems

(C) linear time-variant systems

(D) non-linear time-variant systems

38. A boost converter is operated in the continuous conduction mode in steady state with a constant duty ratio D. If V_o is the magnitude of the DC output voltage and V_s is the magnitude of the DC input voltage, then the ratio V_o / V_s is given by

(A) D

(B) $\frac{1}{D}$

(C) $\frac{1}{1-D}$

(D) $\frac{D}{1-D}$

39. If the loop gain K of a negative feedback system having a loop transfer function

$$\frac{K(s+3)}{(s+8)^2}$$

is to be adjusted to induce a sustained oscillation, then

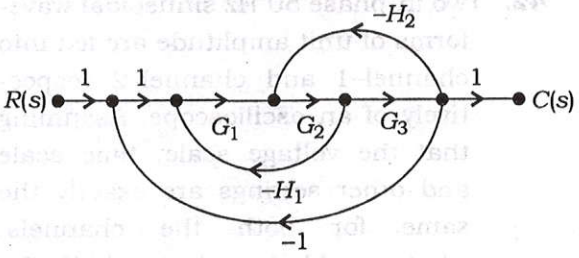
(A) the frequency of this oscillation must be $\frac{4}{\sqrt{3}}$ rad/s

(B) the frequency of this oscillation must be 4 rad/s

(C) the frequency of this oscillation must be 4 or $\frac{4}{\sqrt{3}}$ rad/s

(D) such K does not exist

40. Consider the signal flow graph shown in the given figure :



The $C(s) / R(s)$ will be

(A) $\frac{G_1G_2G_3}{1 - G_1G_2H_1 + G_2G_3H_2 + G_1G_2G_3}$

(B) $\frac{G_1G_2G_3}{1 + G_1G_2H_1 + G_2G_3H_2 + G_1G_2G_3}$

(C) $\frac{G_1G_2G_3}{1 - G_1G_2H_1 - G_2G_3H_2 - G_1G_2G_3}$

(D) None of the above

41. The Laplace transformation of the function

$$f(t) = \frac{A}{t_0}; \quad \text{for} \quad 0 < t < t_0$$
$$= 0; \quad \text{for} \quad t < 0,\ t_0 < t$$

is

(A) $\frac{1}{s}(1 - e^{-st_0})$

(B) $\frac{A}{t_0 s}(1 - e^{-st_0})$

(C) $\frac{A}{t_0}(1 - e^{-st_0 A})$

(D) $\frac{1}{t_0}(1 - e^{-t_0 A})$

42. Two in-phase 50 Hz sinusoidal waveforms of unit amplitude are fed into channel–1 and channel–2 respectively of an oscilloscope. Assuming that the voltage scale, time scale and other settings are exactly the same for both the channels, what would be observed if the oscilloscope is operated in *x-y* mode?

(A) A circle of unit radius

(B) An ellipse

(C) A parabola

(D) A straight line inclined at 45° with respect to the *x*-axis

43. A bulb in a staircase has two switches, one switch being on the ground floor and the other one at first floor. The bulb can be turned ON and also can be turned OFF by any one of the switches irrespective of the state of the other switch. The logic of switching of the bulb resembles

(A) an AND gate

(B) an OR gate

(C) an XOR gate

(D) a NAND gate

44. A cascade of three identical modulo-5 counters has an overall modulus of

(A) 5

(B) 25

(C) 125

(D) 625

45. Thyristor circuits that directly convert polyphase AC voltage from one frequency to another frequency are called

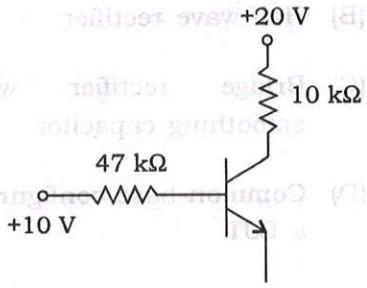
(A) regulator

(B) converter

(C) bidirectional converter

(D) cycloconverter

46. In the given transistor circuit, the collector to ground voltage is +20 V. Which of the following is the probable cause of error?



(A) Collector-emitter terminals shorted

(B) Emitter to ground connection open

(C) 10 kΩ resistor open

(D) Collector-base terminals shorted

47. The complete set of only those logic gates designated as universal gates is

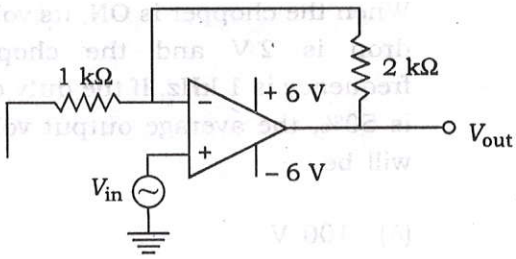
(A) NOT and NAND gates

(B) XNOR, NOR and NAND gates

(C) NOT, OR and AND gates

(D) XOR, NOR and NAND gates

48. The nature of feedback in the OPAMP circuit shown below is



(A) voltage-voltage feedback

(B) voltage-current feedback

(C) current-current feedback

(D) current-voltage feedback

49. In forward voltage triggering, thyristor

(A) changes from OFF state to ON state

(B) inverts the state

(C) changes from ON state to OFF state

(D) state remains the same

50. In a thyristor converter, a free-wheeling diode is used to

(A) add to the conduction current of the thyristor

(B) oppose the thyristor conduction

(C) conduct current during the OFF period of the thyristor

(D) protect the thyristor by providing a shunt path

51. A DC chopper has a resistive load of 10 Ω and an input voltage of 220 V. When the chopper is ON, its voltage drop is 2 V and the chopping frequency is 1 kHz. If the duty cycle is 50%, the average output voltage will be

(A) 100 V

(B) 103 V

(C) 106 V

(D) 109 V

52. A step-up chopper has input voltage of 100 V and output voltage of 300 V. If the non-conducting time of thyristor chopper is 100 μs, the pulse width of the output voltage is

(A) 200 μs

(B) 100 μs

(C) 300 μs

(D) 50 μs

53. A clamping circuit

(A) adds a DC component to an AC signal either side

(B) adds an AC component to a DC signal either side

(C) adds a DC component to an AC signal in positive direction

(D) None of the above

54. Which of the following devices can be considered as a clipping circuit?

(A) Full-wave converter

(B) Half-wave rectifier

(C) Bridge rectifier with a smoothing capacitor

(D) Common-base configuration of a BJT

55. A half-wave rectifier with silicon diode produces (peak) maximum load current of 50 mA through a 1200 Ω resistor. If the voltage drop across the diode is 0·7 V, the PIV of the diode will be

(A) 48·7 V

(B) 48 V

(C) 24 V

(D) 50 V

56. In frequency modulation

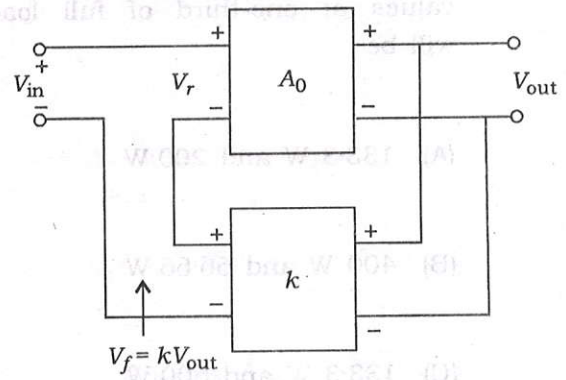
(A) carrier amplitude is changed by the modulating signal

(B) carrier frequency is changed by the modulating signal

(C) if amplitude of modulating signal increases, the carrier frequency remains constant

(D) frequency of the carrier must be lower than the modulating frequency

57. In the feedback network of the given figure, if the feedback factor k is increased, then



(A) input impedance increases and output impedance decreases

(B) both input and output impedances increase

(C) both input and output impedances decrease

(D) input impedance decreases and output impedance increases

58. Which of the following is a result of over-modulation?

(A) Weakening of signal

(B) Distortion

(C) Strengthening of signal

(D) Excessive carrier power

59. For the equation

$$\ddot{x}(t) + 3\dot{x}(t) + 2x(t) = 5$$

the solution $x(t)$ approaches which of the following values as $t \to \infty$?

(A) 0

(B) 5/2

(C) 5

(D) 10

60. A digital-to-analog converter with a full-scale output voltage of 3·5 V has a resolution close to 14 mV. Its bit size is

(A) 4

(B) 8

(C) 16

(D) 32

61. List–I lists different appliances and List–II lists motors for these appliances. Match the appliance with the most suitable motor and choose the right combination among the choices given :

List–I	*List–II*
a. Food mixer	1. Permanent magnet DC motor
b. Cassette tape recorder	2. Single-phase induction motor
c. Domestic water pump	3. Universal motor
d. Escalator	4. Three-phase induction motor
	5. DC series motor
	6. Stepper motor

Codes :

	a	b	c	d
(A)	3	6	4	5
(B)	1	3	2	4
(C)	3	1	2	4
(D)	3	2	1	4

62. A 4-pole lap-wound DC generator has a developed power of P watts and a voltage of E volts. Two adjacent brushes of the machine are removed as they are worn out. If the machine operates with the remaining brushes, the developed voltage and power that can be obtained from the machine are

(A) $\frac{E}{2}$ volts and $\frac{P}{2}$ watts

(B) E volts and $\frac{P}{2}$ watts

(C) E volts and $\frac{P}{4}$ watts

(D) E volts and P watts

63. A DC machine is connected to 220 V supply mains. Its armature resistance is 0·2 Ω. The magnitude of e.m.f. generated so that it may feed 100 A to supply is

(A) 200 V

(B) 220 V

(C) 240 V

(D) 260 V

64. A 4-pole, 50 Hz, 400 V, three-phase induction motor is running at 1440 r.p.m. The frequency of the rotor induced e.m.f. is

(A) 2 Hz

(B) 4 Hz

(C) 1 Hz

(D) 50 Hz

65. The core loss and copper loss of a transformer on full load are 400 W and 600 W respectively. Their values at one-third of full load will be

(A) 133·3 W and 200 W

(B) 400 W and 66·66 W

(C) 133·3 W and 600 W

(D) 400 W and 200 W

66. A 5 kVA, 1000/200 V, 50 Hz, single-phase transformer has the following no-load and short-circuit test data :

No-load test : $W_0 = 90$ W, $I_0 = 1{\cdot}2$ A, $V = 200$ V

Short-circuit test : $W_{sc} = 110$ W, $I_{sc} = 5$ A $V_{sc} = 50$ V

The full-load copper loss and iron loss will be

(A) 90 W and 110 W

(B) 110 W and 100 W

(C) 110 W and 90 W

(D) 90 W and 90 W

67. Cogging and crawling are phenomena associated with

(A) cage induction machines and they are essentially the same

(B) squirrel-cage induction machines, the former at a fraction of its rated speed and the latter during starting

(C) squirrel-cage induction machines, the former during starting and the latter at a fraction of its rated speed

(D) wound-rotor induction machines and they are reduced by skewing, chording and distribution of windings

68. A large capacity 3-phase induction motor is started using a star-delta starter instead of DOL starter. The current

(A) is increased three times

(B) remains constant

(C) is reduced to one-third of its value

(D) is reduced to half of its value

69. The e.m.f. induced in the armature of a DC generator is alternating in nature but in the output circuit, DC is made available by

(A) brush and slip-ring arrangement

(B) brush and commutator arrangement

(C) diode rectifiers

(D) converter circuit

70. For synchronizing an alternator with the bus bar, which of the following conditions is ***not*** applicable?

(A) The generated voltage of the alternator should be equal to the bus bar voltage

(B) The frequency of the generated voltage should be equal to the bus bar frequency

(C) The phase sequence of the voltage generated should be the same as that of the bus bar voltage

(D) The kVA rating of the alternator should be equal to the kVA rating of the other alternators already connected to the bus bar

71. Which of the following statements is ***not*** true for a synchronous motor?

(A) An over-excited synchronous motor draws lagging power factor.

(B) An over-excited synchronous motor draws leading power factor.

(C) At normal excitation, the current drawn by a synchronous motor is the minimum.

(D) At normal excitation, the power factor of the current drawn is unity.

72. In a DC machine, which of the following statements is true?

(A) Compensating winding is used for neutralizing armature reaction while inter-pole winding is used for producing residual flux.

(B) Compensating winding is used for neutralizing armature reaction while inter-pole winding is used for improving commutation.

(C) Compensating winding is used for improving commutation while inter-pole winding is used for neutralizing armature reaction.

(D) Compensating winding is used for improving commutation while inter-pole winding is used for producing residual flux.

73. In a split-phase capacitor-start induction motor, a time phase difference between the currents flowing through the two windings of the stator is produced by

(A) placing the two windings at an angle of 90° in the stator slots

(B) applying two-phase supply across the two windings

(C) introducing capacitive reactance in the auxiliary winding circuit

(D) connecting the two windings in series opposition across a single-phase supply

74. It is desirable to eliminate 5th harmonic voltage from the phase voltage of an alternator. The coils should be short pitched by an electrical angle of

(A) 30°

(B) 36°

(C) 72°

(D) 18°

75. A four-point starter is used to start and control the speed of a

(A) DC shunt motor with armature resistance control

(B) DC shunt motor with field weakening control

(C) DC series motor

(D) DC compound motor

76. The r.m.s. value of a half-wave rectified symmetrical square-wave voltage of 2 V is

(A) $\sqrt{2}$ V

(B) 1 V

(C) $\frac{1}{\sqrt{2}}$ V

(D) $\sqrt{3}$ V

77. The rated voltage of a 3-phase power system is given as

(A) r.m.s. phase voltage

(B) peak phase voltage

(C) r.m.s. line-to-line voltage

(D) peak line-to-line voltage

78. Consider a long, two-wire line composed of solid round conductors. The radius of both the conductors is 0·25 cm and the distance between their centres is 1 m. If this distance is doubled, then the inductance per unit length

(A) doubles

(B) halves

(C) increases but does not double

(D) decreases but does not halve

79. If the fault current is 2000 A, the relay setting is 50% and CT ratio is $\frac{400}{5}$, then the plug setting multiplier will be

(A) 25

(B) 15

(C) 50

(D) 10

80. The relay that has capability of anticipating the possible major fault in a transformer is

(A) over-current relay

(B) differential relay

(C) Buchholz relay

(D) None of the above

81. The per unit impedance of a circuit element is 0·30. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be

(A) 0·30

(B) 0·60

(C) 0·0030

(D) 0·0060

82. The transient stability of a power system can be effectively improved by

(A) excitation improvement

(B) phase-shifting transformer

(C) single-pole switching of circuit breakers

(D) increasing the turbine valve opening

83. A lightning stroke discharges an impulse current of 10 kA (peak) on a 400 kV transmission line having surge impedance of 250 Ω. The magnitude of transient over-voltage travelling waves in either direction assuming equal distribution from the point of lightning strike will be

(A) 1250 kV

(B) 1650 kV

(C) 2500 kV

(D) 2900 kV

84. A negative sequence relay is commonly used to protect

(A) an alternator

(B) a transformer

(C) a transmission line

(D) a bus bar

85. To avoid maloperation of differential protection of transformers connected in Δ-Y mode, the CT must be connected in

(A) Y-Δ mode

(B) Y-Y mode

(C) Δ-Y mode

(D) Δ-Δ mode

86. For enhancing the power transmission in a long EHV transmission line, the most preferred method is to connect a

(A) series inductive compensator in the line

(B) shunt inductive compensator at the receiving end

(C) series capacitive compensator in the line

(D) shunt capacitive compensator at the sending end

87. The angle δ in the swing equation of a synchronous generator is the

(A) angle between stator voltage and current

(B) angular displacement of the rotor with respect to the stator

(C) angular displacement of an axis fixed to the rotor with respect to a synchronously rotating axis

(D) angular displacement of the stator m.m.f. with respect to a synchronously rotating axis

88. For load flow solutions, the quantities specified at load bus are

(A) P and $|V|$

(B) P and Q

(C) P and δ

(D) Q and $|V|$

89. In Gauss-Seidel method of power flow problem, the number of iterations may be reduced if the correction in voltage at each bus is multiplied by

(A) Gauss constant

(B) acceleration constant

(C) blocking factor

(D) deceleration constant

90. For a Y-bus matrix of a 4-bus system given in per unit, the buses having shunt elements are

$$Y_{bus} = j\begin{bmatrix} -5 & 2 & 2{\cdot}5 & 0 \\ 2 & -10 & 2{\cdot}5 & 4 \\ 2{\cdot}5 & 2{\cdot}5 & -9 & 4 \\ 0 & 4 & 4 & -8 \end{bmatrix}$$

(A) 3 and 4

(B) 2 and 3

(C) 1 and 2

(D) 1, 2 and 4

91. In a two-plant system, the load is connected to plant 2. Then

(A) loss coefficients B_{11}, B_{12} and B_{22} are zero

(B) loss coefficient B_{11} is non-zero but B_{12} and B_{22} are zero

(C) loss coefficients B_{11} and B_{12} are non-zero but B_{22} is zero

(D) loss coefficients B_{11} and B_{22} are non-zero but B_{12} is zero

92. Normally Z_{bus} matrix of a power system is a

(A) null matrix

(B) sparse matrix

(C) full matrix

(D) unity matrix

93. A water boiler at home is switched on to the AC mains supplying power at 230 V/50 Hz. The frequency of instantaneous power consumed by the boiler is

(A) 0 Hz

(B) 50 Hz

(C) 100 Hz

(D) 150 Hz

94. The powers generated by two plants are $P_1 = 50$ MW and $P_2 = 40$ MW. If the loss coefficients are

$$B_{11} = 0{\cdot}001,\ B_{22} = 0{\cdot}0025$$
$$B_{12} = -0{\cdot}0005$$

then the power loss will be

(A) 5·5 MW

(B) 4·5 MW

(C) 6·5 MW

(D) 8·5 MW

95. Economic operation of power system is carried out on the basis of

(A) equal incremental fuel cost

(B) equal area criterion

(C) equal fuel cost

(D) all units sharing equal power

96. The knowledge of maximum sag is essential in determining the

(A) ground clearance of the conductor

(B) maximum span of the conductor

(C) maximum stress of the conductor

(D) None of the above

97. The term 'self-GMD' is used to calculate

(A) capacitance

(B) inductance

(C) Both (A) and (B)

(D) resistance

98. A large size synchronous generator is protected against overloads by

(A) over-current relay

(B) mho relay

(C) temperature-sensitive relay

(D) Buchholz relay

99. In central AGC (Automatic Generation Control) of a given control area, the change (error) in frequency is

(A) area control error

(B) volume control error

(C) non-linear control error

(D) optimal control error

100. The receiving-end voltage for a long transmission line under no-load condition is

(A) less than the sending-end voltage

(B) more than the sending-end voltage

(C) equal to the sending-end voltage

(D) None of the above

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