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T. B. C. : CS – 11/10

Test Booklet Series

Serial No. **224874**

B

TEST BOOKLET

**O. C. S. Preliminary Examination
(ELECTRICAL ENGINEERING)**

Time Allowed : 2 Hours

Maximum Marks : 300

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET OF SAME SERIES ISSUED TO YOU.
2. ENCODE YOUR OPTIONAL SUBJECT CODE AS MENTIONED ON THE BODY OF YOUR ADMISSION CERTIFICATE AND ADVERTISEMENT AT APPROPRIATE PLACES ON THE ANSWER SHEET.
3. ENCODE CLEARLY THE TEST BOOKLET SERIES A, B, C OR D, AS THE CASE MAY BE, IN THE APPROPRIATE PLACE IN THE ANSWER SHEET USING BALL POINT PEN (BLUE OR BLACK).
4. You have to enter your Roll No. on the Test Booklet in the Box provided alongside. **DO NOT** write *anything* else on the Test Booklet.
5. This Test Booklet contains **120** items (questions). Each item (question) comprises four responses (answers). You will select the correct response (answer) which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct response (answer), mark (darken) the response (answer) which you consider the best. In any case, choose **ONLY ONE** response (answer) for each item (question).
6. You have to mark (darken) all your responses (answers) **ONLY** on the **separate Answer Sheet** provided, by using **BALL POINT PEN (BLUE OR BLACK)**. See instructions in the Answer Sheet.
7. All items (questions) carry equal marks. All items (questions) are compulsory. Your total marks will depend only on the number of correct responses (answers) marked by you in the Answer Sheet. There will be negative markings for wrong answers. **25 percent of marks allotted to a particular item (question) will be deducted as negative marking for every wrong response (answer).**
8. Before you proceed to mark (darken) in the Answer Sheet the responses to various items (questions) in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions in your **Admission Certificate**.
9. After you have completed filling in all your responses on the Answer Sheet and after conclusion of the examination, you should hand over to the Invigilator the *Answer Sheet* and the *Test Booklet* issued to you. You are allowed to take with you the candidate's copy/second page of the Answer Sheet, after completion of the examination, for your reference.

SEAL

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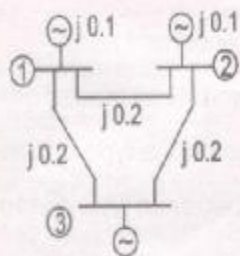
1. An inverter capable of supplying a balanced 3 phase variable voltage variable frequency output is feeding a 3 phase induction motor rated for 50 Hz and 440 V. The stator winding resistance of the motor are negligible. During starting, the current inrush can be avoided without sacrificing the starting torque by suitably applying :
 - (a) Low voltage at rated frequency
 - (b) Low voltage with v/f ratio constant
 - (c) Rated voltage at low frequency
 - (d) Rated voltage at rated frequency
2. It is required to drive a DC shunt motor at different speeds in both directions and also to brake it in both directions. Which of the following would you use ?
 - (a) Half controlled thyristor bridge
 - (b) Full controlled thyristor bridge
 - (c) Dual convertor
 - (d) Diode bridge
3. A half wave SCR controlled circuit with 10 ohms load resistor has an applied voltage of 300 V rms for a conduction angle of 60 degrees. The reading of true rms reading ammeter is :
 - (a) 9.37 A
 - (b) 11.97 A
 - (c) 30 A
 - (d) 0 A
4. A dc to dc chopper from fixed voltage dc source feeds a fixed R-L load and a free wheeling diode. The chopper operates at 1 kHz and 50% duty cycle. Without changing the value of the average d. c. current through the load, if it is desired to reduce the ripple content of the load current, the control action needed will be :
 - (a) Increase chopper frequency keeping duty cycle constant
 - (b) Increase chopper frequency and duty cycle in equal ratio
 - (c) Decrease only chopper frequency
 - (d) Decrease only duty cycle
5. The frequency of ripple in the output voltage of 3 phase half controlled rectifier depends on :
 - (a) Firing angle
 - (b) Load inductance
 - (c) Load resistance
 - (d) Supply frequency
6. When gate triggering is employed, a thyristor can withstand higher value of rate of change of forward current, if (1) gate current is increased, (2) rate of rise of gate current is increased, (3) gate current is decreased and (4) rate of rise of gate current is decreased. The correct statement are :
 - (a) 3 and 4
 - (b) 1 and 4
 - (c) 2 and 3
 - (d) 1 and 2

7. Snubber circuit is used to limit the rate of :
- (a) Rise of current
 - (b) Conduction period
 - (c) Rise of voltage across SCR
 - (d) None of these
8. A SMPS operating at 20 kHz to 100 kHz range uses _____ as the main switching element.
- (a) Thyristor
 - (b) MOSFET
 - (c) Triac
 - (d) UJT
9. A thyristor and transistor as a switch is compared. The true statement in :
- (a) Both require turn-off circuits
 - (b) Voltage drop of thyristor is less than transistor
 - (c) Thyristor requires a continuous gate current
 - (d) Transistor draws a continuous base current
10. In a HVDC transmission scheme, reactive power is needed both for the rectifier at sending end and inverter at receiving end. During the operation of such a dc link the rectifier receives :
- (a) Lagging reactive power and inverter supplies leading reactive power
 - (b) Leading reactive power and inverter supplies lagging reactive power
 - (c) Lagging reactive power and inverter supplies lagging reactive power
 - (d) Leading reactive power and inverter supplies leading reactive power
11. A long distance overhead transmission line of 220 kV rating is to be protected against faults between phases and ground. The fault resistance including that of the ground is found to vary over a wide range. Which one of the following types of relays will give the best performance under the situation indicated above ?
- (a) Over current relay
 - (b) Percentage biased differential relay
 - (c) Reactance type distance relay
 - (d) Impedance type distance relay
12. In the optimum generator scheduling of different power plants the minimum fuel cost is obtained when :
- (a) Only incremental fuel cost of each plant is same
 - (b) Penalty factor of each plant is same
 - (c) Ratio of incremental fuel cost to penalty factor of each plant is the same

(d) Incremental fuel cost of each plant multiplied by its penalty factor is the same

13. The synchronous reactance of a 200 MVA, 10 kV, 3 phase, 50 Hz generator is 1.0 pu at its own base. Its pu reactance at 100 MVA, 20 kV base will be :
- (a) 0.125
(b) 0.200
(c) 0.250
(d) 0.500

14. The sample power system network is shown in figure below. The reactances marked are in per unit (pu) the value of Y_{22} of bus admittance matrix is :



- (a) $j 10$
(b) $j 0.4$
(c) $-j 0.1$
(d) $-j 20.0$
15. Corona loss can be reduced by the use of hollow conductors, because :
- (a) Current density is reduced
(b) Eddy current in conductor is eliminated

(c) For a given cross section, radius of conductor is increased
(d) Better ventilation of the conductor

16. The main criterion for selecting the size of a distributor for a radial distribution system is :
- (a) Voltage drop
(b) Corona loss
(c) Temperature rise
(d) Capital cost
17. The voltage at the two end of a line are 132 kV and its reactance is 40 ohms. The capacity of the line (MW) is :
- (a) 436
(b) 218
(c) 252
(d) 500

18. A medium line with parameter A, B, C, D is extended by connecting a short line of impedance Z in series. The overall ABCD parameters of the series combination will be :

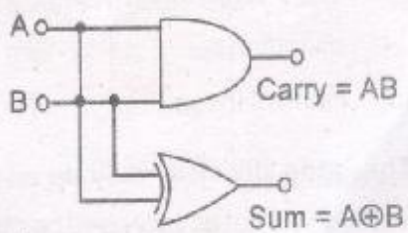
(a) $A, AZ, C + D/Z, D$
(b) $A, AZ + B, C, CZ + D$
(c) $A + BZ, B, C + DZ, D$
(d) $AZ, B, C/Z, D$

19. The most appropriate operating speeds in rpm of generators used in thermal, nuclear and hydro-power plants would respectively be :
- (a) 3000, 300, 1500

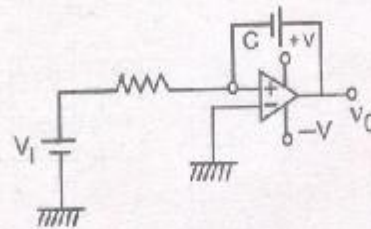
- (b) 3000, 3000, 300
(c) 1500, 1500, 3000
(d) 1000, 900, 750
20. Which type of motor is most suitable for computer printer drive ?
(a) Reluctance motor
(b) Hysteresis motor
(c) Shaded-pole motor
(d) Stepper motor
21. The armature current upon symmetrical 3 phase short circuit of a synchronous machine (neglecting armature resistance) :
(a) Constitutes q-axis current only
(b) Constitutes d-axis current only
(c) Has both d-axis and q-axis components
(d) Short circuit current can not be resolved into d and q axis components
22. A 10 pole, 25 Hz alternator is directly coupled to and is driven by a 60 Hz synchronous motor. Then the number of poles on the synchronous motor are :
(a) 48
(b) 12
(c) 24
(d) 10
23. A 5 kW, 200 V, DC shunt motor has armature resistance of one ohm and shunt field resistance of 100 ohms. At no load, the motor draws 6 A from 200 V supply and runs at 1000 rpm. The total copper loss in the machine is :
(a) 400 W
(b) 16 W
(c) 36 W
(d) 416 W
24. In a 230 V, 10 kW, DC shunt motor, it is required that starting current should not exceed twice its rated armature current. During starting of the motor, the starting resistance of the motor is cut in steps until armature current drops to rated value. The field resistance is 115Ω and total armature resistance is 0.348 ohm . The total resistance at the second stud in ohms is :
(a) 2.432
(b) 1.39
(c) 2.78
(d) 0.348
25. A 4-pole, 40 kW, 400 V, wave connected DC generator has 492 conductors on its armature. The brushes are shifted by an angle of 8 mechanical degrees. The sum of demagnetizing AT per pole and across magnetizing AT per pole is :
(a) 546.67
(b) 1503.33
(c) 2050
(d) 956.67
26. If the armature current is increased to double its previous value and the time

- of communication is halved, the reactance voltage will be :
- (a) Half
 - (b) Same
 - (c) Double
 - (d) Four times
27. A 4-pole, lap wound DC generator has a developed power of P watts and voltage of E volts. Two adjacent brushes of the machine are removed as they were out. If the machine operates with the remaining brushes, the developed voltage and power that can be obtained are :
- (a) E, P
 - (b) $E/2, P$
 - (c) $E, P/4$
 - (d) $E, P/2$
28. Among the parallel combinations of 3-phase to 3-phase transformers, the connection that is not possible is :
- (a) Y-Y to delta-delta
 - (b) Y-Y to Y-Y
 - (c) Y-delta to delta-Y
 - (d) Delta-Y to delta-delta
29. Neglecting losses, the power transferred inductively is equal to that of conductively in case of an autotransformer. Then the secondary to primary ratio of transformer is :
- (a) 0.5
 - (b) 2
 - (c) 1.5
 - (d) None of these
30. A 500 KVA transformer has constant losses of 500 W and copper losses at full load are 2000 W. Then the load at which efficiency is maximum ?
- (a) 250 KVA
 - (b) 500 KVA
 - (c) 1000 KVA
 - (d) 125 KVA
31. A radar is to have a maximum range of 300 km. What is the maximum allowable pulse repetition frequency for unambiguous reception ?
- (a) 500 pulses per second
 - (b) 1000 pulses per second
 - (c) 250 pulses per second
 - (d) None of these
32. Which one of the following is not a PTM ?
- (a) PDM
 - (b) PWM
 - (c) PPM
 - (d) PCM
33. Another name for the horizontal retrace in a TV receiver is :
- (a) Burst
 - (b) Damper
 - (c) Flyback
 - (d) None of these

34. A stationary CW radar transmits at frequency of 5 GHz. The Doppler frequency seen by it when the target has a radial velocity of 120 kmph is :
- (a) 1019 Hz
 - (b) 1111 Hz
 - (c) 11.11 Hz
 - (d) None of these
35. In a colour picture tube, the shadow mask is used to :
- (a) Increase screen brightness
 - (b) Ensure that each beam hits only its own dots
 - (c) Providing degaussing for the screen
 - (d) Reduce X-ray emission
36. Microwave links are generally preferred to co-axial cables for television transmission because :
- (a) They are cheaper
 - (b) Of their greater bandwidth
 - (c) They have less overall phase distortion
 - (d) None of these
37. The code division multiple access technique is not usually used because :
- (a) The system becomes too expensive
 - (b) The circuitry required is very complex
 - (c) It requires very large bandwidth
 - (d) Its technology has not been completely developed as yet
38. The Adcock Antenna has high interval impedance which is :
- (a) Largely capacitive
 - (b) Largely inductive
 - (c) Both (a) and (b)
 - (d) None of these
39. For a fixed Bandwidth, the performance of delta modulation over pulse code modulation is :
- (a) Superior
 - (b) Inferior
 - (c) Same
 - (d) None of these
40. A 400 Watt high frequency carrier wave is modulated to a depth of 75%. The total power in the modulated wave is :
- (a) 552 Watts
 - (b) 512.5 Watts
 - (c) 524 Watts
 - (d) None of these
41. The bandwidth requirement for an FM signal having a modulating frequency of 3.1 kHz and the maximum deviation of 21.7 kHz is :
- (a) 49.6 kHz
 - (b) 50 kHz

- (c) 65 kHz
(d) None of these
42. The phase modulation is widely used in :
(a) Analog transmission
(b) Digital transmission
(c) High power transmission
(d) None of these
43. MOVA, M is :
(a) A register addressing mode
(b) An immediate addressing mode
(c) A register indirect addressing mode
(d) None of these
44. The compliment of the Boolean expression $AB(\bar{B}C + AC)$ is :
(a) $(\bar{A} \cdot \bar{B}) + (B\bar{C} + \bar{A}\bar{C})$
(b) $(\bar{A} + \bar{B}) + (B + \bar{C}) \cdot (\bar{A} + \bar{C})$
(c) $(\bar{A} + \bar{B}) \cdot (B + \bar{C}) \cdot (\bar{A} + \bar{C})$
(d) $(A + B) \cdot (\bar{B} + C) \cdot (A + C)$
45. A combinational circuit is one in which the output depends on the :
(a) Input combination at that time
(b) Input combination and the previous output
(c) Input combination at that time and the previous input combination
(d) Present output and the previous output
46. The dynamic MOS RAM uses one of the following as storage cell is :
(a) Flip-flop
(b) Small capacitor and a MOS transistor
(c) Register
(d) None of these
47. Which of the following is used as a Binary to Gray code converter ?
(a) X-OR gate
(b) NOR gate
(c) AND gate
(d) None of these
48. A block of successive memory locations that is accessible on a Last in, First out basis is called :
(a) Register
(b) Program counter
(c) Stack
(d) Accumulator
49. The circuit given below is :

(a) An half adder circuit
(b) Full adder circuit
(c) Half subtractor circuit
(d) Full subtractor circuit

50. Which of the following is related to emitter coupled logic circuit ?
- High speed
 - High power dissipation
 - Does not operate fully saturated
 - All of these
51. The higher operating speed of a TTL gate is mainly due to :
- An input resistor with single emitter
 - An input transistor with multiple emitters
 - An input diode
 - None of these
52. The h-parameters are called hybrid parameters because :
- They are obtained from different characteristics
 - They have mixed dimensions
 - They are mixed with other parameters
 - All of these
53. For an op-amp having a slow rate of $2V/\mu s$, the maximum closed loop voltage gain when the input signal varies by 0.5 V in $10 \mu s$ is :
- 10
 - 40
 - $\frac{1}{40}$
 - None of these
54. The stability of a crystal oscillator operating in a parallel resonant mode is :
- High
 - Low
 - Zero
 - None of these
55. Which of the following devices is used as a voltage controlled resistor ?
- JFET
 - Diode
 - BJT
 - SCR
56. The circuit shown is a :



- Ramp generator
- Low pass filter
- High pass filter
- None of these

57. For a better differential amplifier, the Common Mode Rejection Ratio (CMRR) should be :
- Large
 - Low
 - Unity
 - None of these

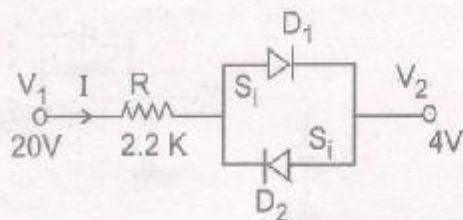
58. A major advantage of an emitter follower is that it provides :

- (a) Maximum gain
- (b) Maximum efficiency
- (c) Maximum output impedance
- (d) Maximum distortion

59. The Field Effect Transistor (FET) is a :

- (a) Bipolar device
- (b) Voltage controlled device
- (c) Current controlled device
- (d) None of these

60. The current 'I' through R in the network shown is :



- (a) 6.5 mA
- (b) 7.27 mA
- (c) 8 mA
- (d) 9.01 mA

61. A Cathode Ray Oscilloscope is being used to display a voltage waveform in a circuit that contains both an AC voltage source and a DC voltage source. If the oscilloscope's input-coupling switch is set to AC, the scope displays _____.

- (a) A combination of AC and DC voltages

- (b) AC voltage only
- (c) DC voltage only
- (d) Neither DC nor AN voltage

62. The following terms used in the context of an instrument are numbered as shown :

- (1) Accuracy, (2) Sensitivity,
- (3) Precision and (4) Reslution.

Match these with their possible definitions listed below :

- P. Repeatability of readings on successive observations
- Q. Smallest perceptible change in the output
- R. Deviation of the output from the true value
- S. Minimum value of the input from the true value
- T. Ratio of the change in the instrument reading to the change in the measured variable

- (a) 1 - P, 2 - Q, 3 - R, 4 - S
- (b) 1 - S, 2 - Q, 3 - P, 4 - T
- (c) 1 - R, 2 - T, 3 - P, 4 - Q
- (d) 1 - T, 2 - Q, 3 - P, 4 - R

63. The resolution of a 4bit counting ADC is 0.5 V. For an analog input of 6.6 V, the digital output of ADC will be :

- (a) 1110

- (b) 1011
(c) 1101
(d) 1100
64. The purpose of providing a mirror behind the pointer in a measuring instrument is :
- (a) The scale is illuminated through mirror
(b) With the help of mirror it can be seen whether the pointer is bent or not
(c) The mirror is semi-transparent so as to allow the observation of the interior of the instrument
(d) Reading errors due to inclined observations are eliminated by removing parallax between the pointer and its image in the mirror
65. In an experiment, it was observed that when the length of a wire in an electrical circuit is doubled, everything else remaining same, the current becomes half. On the other hand, if the thickness (diameter) of the wire is doubled, the current becomes 4 times. Two wires W_1 and W_2 of the same metal have the same current passing through them. The thickness of wire W_2 is twice that of W_1 , then the length of the wire W_2 is :
- (a) Sixteen times that of wire W_1
(b) Four times that of wire W_1
(c) Two times that of wire W_1
(d) Same as that of wire W_1
66. A metal strain gauge has factor of two. Its nominal resistance is 120 ohms. If it undergoes a strain of 10^{-5} , the value of change of resistance in response to the strain is :
- (a) 240 Ohms
(b) 2×10^{-5} Ohms
(c) 2.5×10^{-5} Ohms
(d) 1.2×10^{-3} Ohms
67. Moving Iron instruments have a scale which is :
- (a) Uniform
(b) Cramped at both end
(c) Logarithm
(d) None of these
68. Two holes are provided in the rotating disc of an energy meter to :
- (a) Cut the eddy current path
(b) Compensate friction at light load
(c) Avoid creeping
(d) Reduce frictional force
69. Hamming Code is
- (a) An error correction code system
(b) An error indication code system
(c) A programmable conversion code system
(d) None of these

70. Cycle time is the time required for the execution of a :
- (a) Item to be written and then read from the memory
 - (b) Item to be read from the memory
 - (c) Programme Instruction
 - (d) Subroutine
71. Which of the flag conditions are not available in 8085 Microprocessor ?
- (a) Zero Flag
 - (b) Parity Flag
 - (c) Overflow Flag
 - (d) Auxiliary Carry Flag
72. To correct and eliminate errors in programmes, the act of using an instruction, programme or action designed in software is called :
- (a) Interrupting
 - (b) Cross assembling
 - (c) Documentation
 - (d) Debugging
73. A block of successive memory locations that is accessible on a Last in First out (LIFO) basis is called :
- (a) Accumulator
 - (b) Register
 - (c) Pointer
 - (d) Stack
74. A six bit alpha numeric code is able to code _____ characters.
- (a) 36
 - (b) 64
 - (c) 48
 - (d) 128
75. How many digits in binary notation are required for the decimal number 17 ?
- (a) 4
 - (b) 6
 - (c) 7
 - (d) 5
76. For a first order instrument a 5% settling time is equal to :
- (a) Three times the time constant
 - (b) Two times the time constant
 - (c) The time constant
 - (d) Time required for the output to reach 5% of the final value
77. A system has transfer function $G(s) = \frac{(s + 1)}{((1 + s/10)(1 + s/100))}$. The maximum phase lag in its Bode plot is :
- (a) - 180 deg
 - (b) - 135 deg
 - (c) 90 deg
 - (d) - 270 deg
78. Which of the following is true for PD controller ?
- (a) Transient response becomes sluggish
 - (b) It is a high pass filter
 - (c) It is a lead compensator
 - (d) All of these

79. A unity feedback second order control system with a step input have approximately 6% overshoot and with settling time = 2sec. The value of damping ratio (ξ) and undamped natural frequency (ω) in rad/s of this closed loop control system are respectively :
- 0.5, 5
 - 0.7, 8.982
 - 0.2, 4
 - 0.667, 3
80. The polar plot of a system with transfer function $G(s) = \frac{K}{s(s+T)}$ for +ve T and -ve K will be :
- In the first quadrant
 - In the second quadrant
 - In the third quadrant
 - In the fourth quadrant
81. The Open Loop Transfer Function (OLTF) of a unity feedback system is given by $G(s) = \frac{10}{s^2(s+10)(s^2+3s+1)}$. Find the steady state error when subjected to an input given by $r(t) = A + Bt + Ct^2$.
- 1
 - 100
 - C
 - 10
82. Find the range of values of K for the system to be stable with the given characteristic equation $S^3 + 2KS^2 + (K+2)S + 4 = 0$:
- $K = 0$
 - $K > 0.732$
 - $K > 8.67$
 - $K < 2$
83. A unity feedback control system has Open Loop Transfer Function (OLTF) is $G(s) = \frac{K}{s(s^2 + 6s + 25)}$. Find the value of K at which the root loci will cross the imaginary axis :
- 150
 - 50
 - 25
 - 6
84. What are the next four terms in the sequence $u_{n+2} - 5u_{n+1} + 6u_n = 20$, where $u_1 = 4$ and $u_2 = 9$?
- $u_2 = 9, u_3 = 14, u_4 = 74, u_5 = 308$
 - $u_3 = 41, u_4 = 171, u_5 = 629, u_6 = 2139$
 - $u_2 = 9, u_3 = 41, u_4 = 171, u_5 = 629$
 - $u_3 = 14, u_4 = 74, u_5 = 308, u_6 = 1116$
85. A system with an input $x(t)$ and output $y(t)$ is described by the relation $y(t) = bx(t) + x^2(t)$ is described by :
- Linear time invariant system

- (b) Linear and time varying system
 (c) Nonlinear system
 (d) None of these
86. Highest frequency component of a speech signal needed for telephonic communication is about 3.1 kHz. Suggest a suitable value for the sampling rate :
- (a) 6 kHz
 (b) 8 kHz
 (c) 10 kHz
 (d) 12 kHz
87. A signal represented by $x(t) = 5 \cos(400\pi t)$ is sampled at 300 Hz. The resulting samples are passed through an ideal LPF with cut-off frequency of 150 Hz. Which of the following is contained in the output of LPF ?
- (a) 100 Hz
 (b) 100 Hz, 150 Hz
 (c) 20, 100, 150 Hz
 (d) 50 Hz, 100 Hz
88. The initial and final value of $x(z) = \frac{2z(z - 5/12)}{[(z - 1/2)(z - 1/3)]}$; $|z| < (0.5)$ is respectively :
- (a) 2, 0
 (b) 0, 2
 (c) 0, 1
 (d) 1, 0
89. An input $x(t) = \exp(-2t) u(t) + \delta(t - 6)$ is applied to an LTI system with impulse response $h(t) = u(t)$. The output is :
- (a) $[1 - \exp(-2t) u(t)] + u(t + 6)$
 (b) $[1 - \exp(-2t) u(t)] + u(t - 6)$
 (c) $0.5 [1 - \exp(-2t) u(t)] + u(t + 6)$
 (d) $0.5 [1 - \exp(-2t) u(t)] + u(t - 6)$
90. Given the signal $x(t) = 16 \cos(20\pi t + \pi/4) + 6 \cos(30\pi t + \pi/6) + 4 \cos(40\pi t + \pi/3)$. The power contained in the frequency interval 12 Hz to 22 Hz is :
- (a) 22 W
 (b) 26 W
 (c) 10 W
 (d) 20 W
91. Schottky diodes are confined to :
- (a) Low speed logic gates
 (b) High speed logic gates
 (c) Logic gates
 (d) Medium speed logic gates
92. Potential reliability problem occurs when the sum of the small signal current gains of the parasitic transistors _____
- (a) Equal to unity
 (b) Exceeds unity
 (c) Equals to zero
 (d) Less than unity

93. The MOS transistor is a high-impedance device, so that its power dissipation is :
- High
 - Low
 - Medium
 - Very High
94. Mesa isolation includes n-GaAs on :
- Si GaAs
 - GaAs
 - Si
 - None of these
95. The volume concentration related to diffusion is given by the formula :
- $N_1 = \frac{\sqrt{3dn_1}}{A_1}$
 - $N_1 = \frac{\sqrt{3n_1}}{Ad}$
 - $N_1 = \frac{\sqrt{3dA}}{n_1}$
 - $N_1 = \frac{n_1A}{\sqrt{3d}}$
96. Which is an important mechanical etching process of physical etching ?
- Sputtering
 - Ion milling
 - Surface polishing
 - None of these
97. The silicon used for electrical purposes have silicon percentage :
- 0.5%
 - 2.5%
 - 3.5%
 - None of these
98. Hall's effect can be used to measure :
- Electric field intensity
 - Magnetic field intensity
 - Carrier concentration
 - None of these
99. It is possible to obtain P-type or N-type semiconductor from a simple compound by adding Ge. That compound is :
- InSb
 - GaP
 - GaAs
 - None of these
100. The thickness of the depletion layer in a PN junction is in the order of :
- 10^6 m
 - 10^{-10} m
 - 10^{-4} m
 - None of these
101. Which of the following composition corresponds to common stainless steel ?
- 18Ni – 8Cr – 1Ti – 0.3C – Fe
 - 8Ni – 18Cr – 1Ti – 0.2C – Fe

- (c) 8Ni – 18Cr – 1Mn – 0.1C – Fe
(d) None of these
102. Which of the following composition corresponds to common soldering alloys ?
(a) 85Sn – 15Pb
(b) 85Pb – 15Sn
(c) 70Pb – 15Pb – 15B
(d) None of these
103. Above the Curie temperature, a magnetic material become :
(a) Ferromagnetic
(b) Paramagnetic
(c) Diamagnetic
(d) None of these
104. Retentivity of a magnetic material is :
(a) The ability to retain residual magnetism
(b) The demagnetization force when field is reversed
(c) The ability to cover up lag in field when field is increasing
(d) None of these
105. Phase velocity of a telephone line having $R = 30 \Omega/\text{km}$, $L = 100 \text{ mH}/\text{km}$, $C = 20 \mu\text{F}/\text{km}$ at $f = 1 \text{ kHz}$ is :
(a) $6 \times 10^5 \text{ m/s}$
(b) $7 \times 10^5 \text{ m/s}$
(c) $8 \times 10^5 \text{ m/s}$
(d) $9 \times 10^5 \text{ m/s}$
106. Percentage of incident power reflected from a transmission line of 72Ω characteristic impedance is :
(a) 1.24%
(b) 2.24%
(c) 3.24%
(d) 4.24%
107. Electric field 100m from a $\lambda/2$ antenna at 2 MHz with current 60A.
(a) $31.2 + j18 \text{ V/m}$
(b) $-31.2 + j18 \text{ V/m}$
(c) $-31.2 - j18 \text{ V/m}$
(d) $31.2 - j18 \text{ V/m}$
108. Two point charges $Q_1 = 10 \mu\text{C}$ and $Q_2 = 20 \mu\text{C}$ are placed at coordinates (1, 1, 0) and (-1, -1, 0) respectively. The total electric flux density passing through a plane $z = 20$ will be :
(a) $7.5 \mu\text{C}$
(b) $13.5 \mu\text{C}$
(c) $15.0 \mu\text{C}$
(d) $22.5 \mu\text{C}$

109. Consider the following statements with reference to the equation $\nabla \cdot \mathbf{J} = -\delta P / \delta t$:

- (i) This is the point form of the continuity equation.
- (ii) Divergence of current density is equal to the decrease of charge for unit volume per unit at every point.
- (iii) This is Maxwell's equation.
- (iv) This represents the conservation of charge.

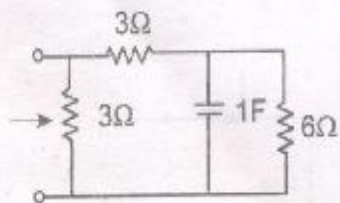
Select the correct answer :

- (a) Only (ii) and (iv) are true
- (b) (i), (ii) and (iii) are true
- (c) (ii), (iii) and (iv) are true
- (d) (i), (ii) and (iv) are true

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

- (a) \vec{E}
- (b) $|\vec{E}|$
- (c) Null vector
- (d) Zero

111. The driving point impedance Z_1 for the shown circuit is given by :



(a) $\left(\frac{3}{2}\right) \frac{\left(s + \frac{1}{2}\right)}{\left(s + \frac{1}{3}\right)}$

(b) $\frac{\left(\frac{3}{2}\right) \left(s + \frac{1}{3}\right)}{\left(s + \frac{1}{2}\right)}$

(c) $\frac{3 \left(s + \frac{1}{2}\right)}{\left(s + \frac{1}{3}\right)}$

(d) $\frac{3 \left(s + \frac{1}{3}\right)}{\left(s + \frac{1}{2}\right)}$

112. The reflection coefficient resulting from mismatching a 50Ω and 300Ω transmission line will be :

- (a) 1.0
- (b) 0.875
- (c) 0.714
- (d) 0.166

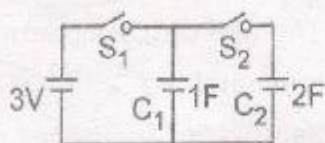
113. The no. of fundamental loops for a network with 'n' nodes and 'b' branches is :

- (a) $b - n + 1$
- (b) $b - n$
- (c) $n - b + 1$
- (d) None of these

114. One of the watt meters connected to measure the power in a balanced 3-phase load will indicate when load p.f. is :

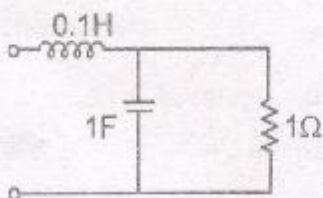
- (a) Unity
- (b) Zero
- (c) 0.5
- (d) None of these

115. In the figure shown, all elements used are ideal. For $t < 0$, S_1 remained closed and S_2 open. At $t = 0$, S_1 is opened and S_2 is closed. If the voltage across the capacitor C_2 at $t = 0$ is zero, the voltage across the capacitor combination at $t = 0^+$ will be :



- (a) 1 V
- (b) 2 V
- (c) 1.5 V
- (d) 3 V

116. The resonant frequency for the given circuit will be :



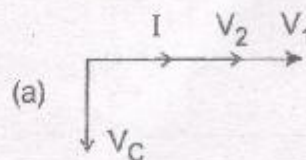
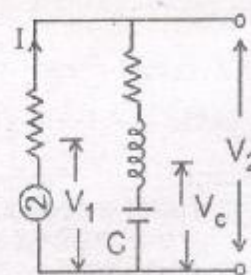
- (a) 1 rad/sec

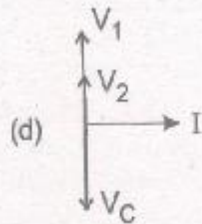
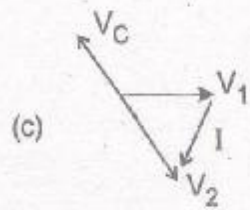
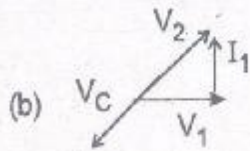
- (b) 2 rad/sec
- (c) 3 rad/sec
- (d) 4 rad/sec

117. The Thevenin's equivalent of a circuit operating at $\omega = 5$ rad/sec, has $V_{oc} = 3.71 \angle -15.9^\circ$ and $Z_0 = 2.38 - j0.667 \Omega$. At this frequency, the minimum realization of the Thevenin's impedance will have a :

- (a) Resistor and a capacitor and an inductor
- (b) Resistor and a capacitor
- (c) Resistor and an inductor
- (d) Capacitor and an inductor

118. The circuit shown in the figure is energized by a sinusoidal voltage source V_1 at a frequency which causes resonance with a current of I . The phasor diagram which is applicable to this circuit is :





119. For the two port network in the fig(1), the Z-Matrix is given by :

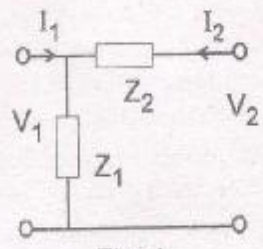


Fig. 1

- (a) $\begin{pmatrix} Z_1 & Z_1 + Z_2 \\ Z_1 + Z_2 & Z_2 \end{pmatrix}$
- (b) $\begin{pmatrix} Z_1 & Z_1 \\ Z_1 + Z_2 & Z_2 \end{pmatrix}$
- (c) $\begin{pmatrix} Z_1 & Z_2 \\ Z_2 & Z_1 + Z_2 \end{pmatrix}$
- (d) $\begin{pmatrix} Z_1 & Z_1 \\ Z_1 & Z_1 + Z_2 \end{pmatrix}$

120. Which of the following does not have dual relation ?

- (a) Current – voltage
- (b) Inductance – capacitance
- (c) Tie set-cut-set
- (d) Resistance – reactance



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