Sl. No. : [redacted]

CEELE/18

Register Number | | | | | | | | | |

2018

ELECTRICAL ENGINEERING
(Degree Standard)

Time Allowed : 3 Hours] **[Maximum Marks : 300**

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

IMPORTANT INSTRUCTIONS

1. The applicant will be supplied with Question Booklet 15 minutes before commencement of the examination.
2. This Question Booklet contains **200** questions. Prior to attempting to answer the candidates are requested to check whether all the questions are there in series and ensure there are no blank pages in the question booklet. **In case any defect in the Question Paper is noticed it shall be reported to the Invigilator within first 10 minutes and get it replaced with a complete Question Booklet. If any defect is noticed in the Question Booklet after the commencement of examination it will not be replaced.**
3. Answer **all** questions. **All** questions carry equal marks.
4. You must write your Register Number in the space provided on the top right side of this page. Do not write anything else on the Question Booklet.
5. An answer sheet will be supplied to you, separately by the Room Invigilator to mark the answers.
6. You will also encode your Question Booklet Number with Blue or Black ink Ball point pen in the space provided on the side 2 of the Answer Sheet. If you do not encode properly or fail to encode the above information, action will be taken as per commission's notification.
7. Each question comprises *four* responses (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
8. In the Answer Sheet there are **four** circles Ⓐ, Ⓑ, Ⓒ and Ⓓ against each question. To answer the questions you are to mark with Blue or Black ink Ball point pen ONLY ONE circle of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. *e.g.* If for any item, Ⓑ is the correct answer, you have to mark as follows :

Ⓐ ● Ⓒ Ⓓ

9. You should not remove or tear off any sheet from this Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the time of examination. After the examination is concluded, you must hand over your Answer Sheet to the Invigilator. You are allowed to take the Question Booklet with you only after the Examination is over.
10. The sheet before the last page of the Question Booklet can be used for Rough Work.
11. Do not tick-mark or mark the answers in the Question Booklet.
12. Applicants have to write and shade the total number of answer fields left blank on the boxes provided at side 2 of OMR Answer Sheet. An extra time of 5 minutes will be given to specify the number of answer fields left blank.
13. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.

SEAL

△

SPACE FOR ROUGH WORK

1. The Y parameter of the following network is $\begin{bmatrix} 0 & -1/2 \\ 1/2 & 1 \end{bmatrix}$

(A) Non reciprocal and active

(B) Non reciprocal and passive

(C) Reciprocal and active

(D) Reciprocal and passive

2. Two coupled inductors $L_1 = 0.2\,\text{H}$ and $L_2 = 0.8\,\text{H}$ have coefficient of coupling $K = 0.7$. The mutual inductance M is

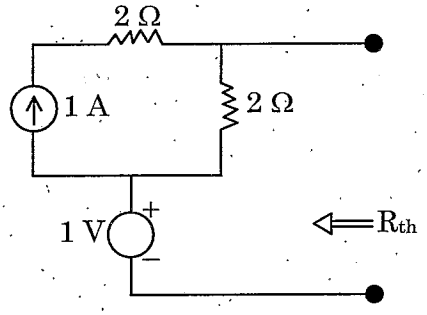
(A) 0.2 H

(B) 0.28 H

(C) 0.112 H

(D) 1 H

3. The Thevenin's equivalent circuit resistance R_{th} for the given network is



(A) 1 Ω

(B) 2 Ω

(C) 4 Ω

(D) Infinity

4. A parallel RLC circuit has $R = 10000\,\Omega$, $L = 10\,mH$ and $C = 1\,\mu F$. The resonant frequency W_0 (rad/sec) and Q are respectively given by

(A) 10^4 and 200

(B) 10^2 and 1

(C) 10^4 and 100

(D) 10^2 and 100

5. A balanced delta connected load has an impedance of $9\angle 30^\circ\ \Omega$/phase. What is the impedance/phase of its equivalent star?

(A) $27\angle 30^\circ\ \Omega$ (B) $27\angle 90^\circ\ \Omega$

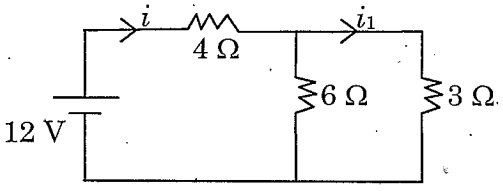
(C) $3\angle 30^\circ\ \Omega$ (D) $3\angle 20^\circ\ \Omega$

6. In RLC parallel resonance the expression for quality factor is

(A) $1/W_0RC$ (B) W_0L/R

(C) W_0RC (D) L/W_0R

7. Calculate the power dissipation in 3Ω resistor



(A) 1.33 W (B) 5.33 W

(C) 2.33 W (D) 4.33 W

8. Match List I with List II and select the correct answer

List I (Network Theorems)	List II (Most distinguished property of network)
(a) Reciprocity	1. Impedance matching
(b) Tellegen's	2. Bilateral
(c) Superposition	3. $\sum_{k=0}^{n} V_k i_k = 0$
(d) Maximum power transfer	4. Linear
	5. Non-linear

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

9. Given $V = 3x^2 + 4y^2$ volts. What is the value of E?

(A) $E = -6xi - 8yj$ (B) $E = 6xi + 8yi$

(C) $E = 12xi + 16yj$ (D) $E = -6xi + 8yj$

10. What is the field (H) due to toroid having N turns and length l carrying a filamentary current I?

(A) $H = NIl$ (B) $H = \frac{l}{NI}$

(C) $H = NI^2 / l$ (D) $H = \frac{NI}{l}$

11. The Biot-Savart law giving magnetic flux density B due to a wire carrying current I is

(A) $\oint \frac{\mu_0}{4\pi} \frac{I^2 \times \overline{dl} \times \overline{a}_R}{R^2} = B$ (B) $B = \oint \frac{\mu_0}{4\pi} \frac{I\overline{dl} \times \overline{a}_R}{R^2}$

(C) $B = \frac{1}{4\pi\mu_0} \oint \frac{Idl}{R}$ (D) $B = \oint \mu_0 4\pi \frac{I\overline{dl} \times \overline{a}_R}{R^2}$

12. Force experienced by a charge q placed in static electric field of intensity E is given by

(A) $\overline{F} = \overline{E}q$ (B) $F = \frac{E^2}{q}$

(C) $\overline{F} = \frac{\overline{E}}{q}$ (D) $\overline{F} = \overline{E}q^2$

13. Total magnetic flux coming out of closed surface is

(A) 1 (B) zero

(C) maximum (D) minimum

14. Statement A : A uniform plane wave is a transverse electro magnetic wave

Statement B : A Uniform plane wave can physically exist and represent finite energy

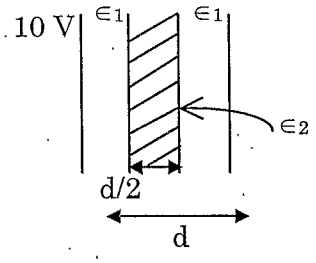
(A) Both Statements A and B are true and B is correct explanation of A

(B) Both Statements A and B are the true both B is not explanation of A

(C) Statement A is true and B is false

(D) Statement A is false and B is true

15. A parallel plate capacitor with two dielectric material is shown in the figure. If the potential difference between one of the plate and nearest surface of dielectric is 2V, then the ratio of $\in_1 : \in_2$ is



(A) 1 : 4 (B) 2 : 3

(C) 3 : 2 (D) 4 : 1

16. Statement A :

$\oint_S \vec{B} \cdot \overrightarrow{dS} = 0$ where B = magnetic flux density.

Statement B :

Tubes to magnetic flux have no source or sinks

(A) Statement A is true. Statement B is true and it is explanation for statement A

(B) Statement A and B are true. But is not correct explanation for A

(C) Statement A is true and B is false

(D) Statement A is false and B is true

17. Two coils of inductance 4 and 6 Henry are connected in series. If their mutual inductance is 3 Henry, what is the equivalent inductance of the combination if mutual inductance oppose the self inductance

(A) 2 H (B) 1 H

(C) 4 H (D) 16 H

18. All the charges on a charged conducting body remains on the ———— of the body

(A) Inside (B) Surface

(C) Outside (D) Origin

19. A binary Ladder D/A converter is constructed by using resistors having

(A) Individual values
(B) Only one value
(C) Only two values
(D) Only three values

20. The stroboscope is used to measure?

(A) displacement
(B) pressure
(C) speed
(D) temperature

21. Digital to analog convert can be considered as

(A) decoding device
(B) encoding device
(C) multiplexes
(D) summing amplifier

22. Match the following :

	List I (Transducers)		List II (Characteristics)
(a)	Thermocouple	1.	Modulated output
(b)	Thermistor	2.	Resistance changes with pressure
(c)	Strain gauge	3.	Negative temperature coefficient
(d)	LVDT	4.	Constant temperature at one end

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

23. Load cell essentially is a

(A) Thermistor
(B) Strain gauge
(C) Photo voltaic cell
(D) Photo diode

24. In an LVDT, the core is made up of a

(A) Magnetic material
(B) Non-magnetic material
(C) High permiability nickel - iron hydrogen annealed material
(D) Low permiability nickel iron hydrogen annealed

25. A meter reads 127.50 V and the true value of the voltage is 127.43 V. Calculate the static error

(A) 254.93 V
(B) 127.465 V
(C) + 0.07 V
(D) – 0.07 V

26. The resistance of a shunt for a precision grade ammeter can be best measured by

(A) Kelvin's double bridge
(B) Schering's bridge
(C) De Sauty's bridge
(D) Maxwell's bridge

27. Siemens is a unit for measuring

(A) Resistance
(B) Flux density
(C) Conductance
(D) Electric field

28. If σ is standard deviation, probable error is

(A) σ
(B) $\pm 1.19\,\sigma$
(C) $\pm 0.6745\,\sigma$
(D) $\pm 0.4125\,\sigma$

29. When the system in Fig. 1 is subjected to a unit-step input, the system output responds as in Fig. 2. The values of K and T from the response curve are

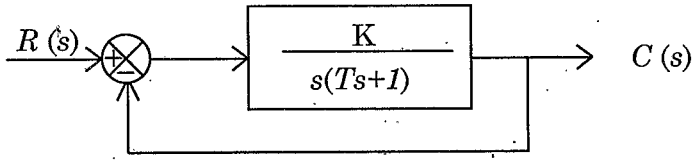


Fig. 1

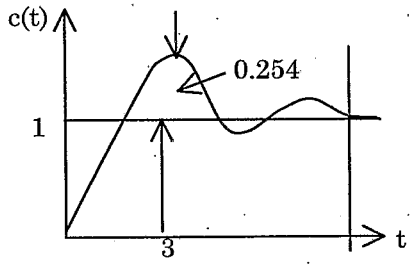


Fig. 2

(A) K = 1. 09, T = 1.42
(B) K = 1.42, T = 1.09
(C) K = 1, T = 1
(D) K = 0, T = 0

30. The Nyquist plot of a system passes through $-1+j0$ point then phase margin of the system is given by

(A) 45° (B) 90°

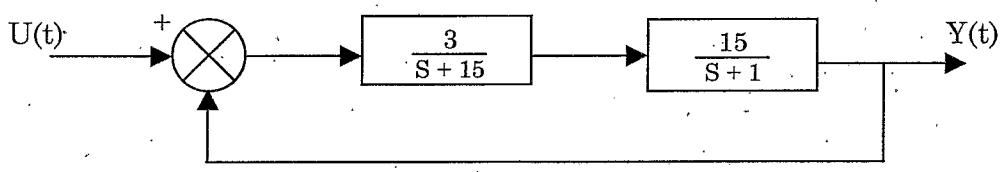
(C) 180° (D) 0°

31. For the equation $S^3 - 4S^2 + S + 6 = 0$. The number of roots in left half of S-plane will be

(A) 0 (B) 1

(C) 2 (D) 3

32. The steady state error for the system below to unit step input is



(A) 25% (B) 0.75%

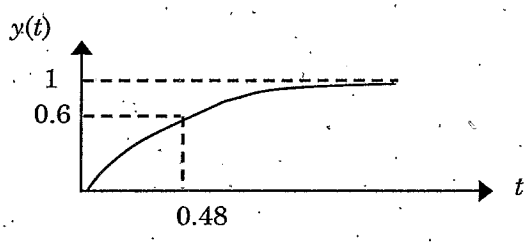
(C) 6% (D) 33%

33. Mass, in force-voltage analogy, is analogous to

(A) charge (B) current

(C) inductance (D) resistance

34. The step response of a first order system is as shown



The time constant of the system is

(A) 0.612 (B) 0.524

(C) 0.48 (D) 52.4

35. Which of the following represents the transfer function of a closed loop control system with negative feedback?

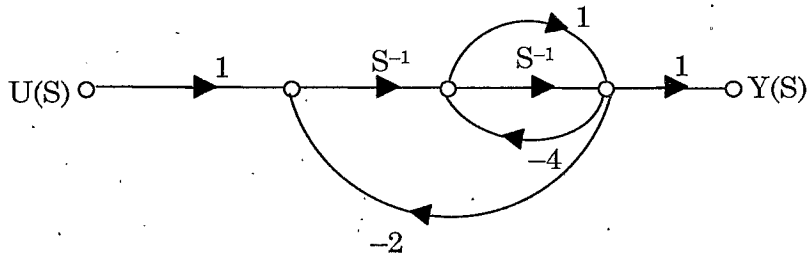
(A) G

(B) $\frac{G}{H}$

(C) $\frac{G}{(1-GH)}$

(D) $\frac{G}{(1+GH)}$

36. The signal flow graph for a system is given below. The transfer function $\frac{Y(s)}{U(s)}$ for this system is



(A) $\frac{s+1}{5s^2+6s+2}$

(B) $\frac{s+1}{s^2+6s+2}$

(C) $\frac{s+1}{s^2+4s+2}$

(D) $\frac{1}{5s^2+6s+2}$

37. As load p.f of an alternator becomes more leading, the value of generated voltage required to give rated terminal voltage

(A) increases

(B) remains unchanged

(C) decreases

(D) varies with rotor speed

38. Synchronous condenser means

(A) A synchronous motor with capacitor connected a cross stator terminals to improve PF

(B) A synchronous motor operating at full load with leading PF

(C) An over excited synchronous motor partially supplying mechanical load and also improving PF of the system to which it is connected

(D) An over excited synchronous motor operating at no load with leading PF to improve the PF of the system

39. It is desired to operate a $3\phi, 440V, 60$ Hz induction motor from a 25 Hz source. The voltage that should be applied to the machine if the air gap flux density is to be maintained at its normal value is

(A) 183 V
(B) 1056 V
(C) 105.7 V
(D) 609.7 V

40. Which of the following can be obtained by equivalent circuit of an induction machine?

(A) Complete performance characteristics of the machine
(B) Temperature rise in the core
(C) Type of protection used in the machine
(D) Design parameters of the winding

41. The advantage of double squirrel cage induction motor over single cage rotor is to improve

(A) Speed regulation
(B) Power factor
(C) Slip
(D) Starting torque

42. The equivalent resistance of the primary of a transformer having K = 5 and $R_1 = 0.1\,\Omega$ when referred to secondary becomes ———— ohms

(A) 0.5
(B) 0.02
(C) 0.004
(D) 2.5

43. When a 400-Hz transformer is operated at 50 Hz its KVA rating is

(A) reduced to 1/8
(B) increased 8 times
(C) unaffected
(D) increased 64 times

44. The function of oil in a transformer is to provide

(A) Insulation and cooling
(B) Protection against lighting
(C) Protection against short circuit
(D) Lubrication

45. A 25 KVA, 3300 /230 V, single phase transformer has iron and copper losses of 350 W and 400 W. The efficiency at 0.8 p.f is

(A) 96.39%
(B) 97.09%
(C) 98.43%
(D) 98.04%

46. If the supply frequency increases, then skin effect is

(A) increased
(B) decreased
(C) unaltered
(D) infinity

47. Base current in amperes is

(A) $\frac{\text{Base kVA}}{\sqrt{3} \times \text{kV}_{\text{Base}}(\text{line} - \text{line})}$
(B) $\frac{\text{Base kVA}}{3 \times \text{kV}_{\text{Base}}(\text{line} - \text{line})}$
(C) $\frac{\text{Base kVA}}{\text{kV}_{\text{Base}}(\text{line} - \text{line})}$
(D) $\frac{\text{Base kVA}}{2}$

48. Reset value of a relay is

(A) the value of the actuating quantity above which the relay operates
(B) the value of the actuating quantity below which the relay opens its contact and comes to original position
(C) the value of the actuating quantity when the fault clears
(D) the time between the actuating quantity exceeds pick up value to the instant the relay closes

49. A circuit breaker is rated at 1500 A, 1800 MVA, 33 kV, 3-sec, 3 phase oil circuit breaker. The short time rating of the circuit breaker is

(A) 1500 A
(B) 80.3046 kA
(C) 1800 A
(D) 31.492 kA

50. The potential difference between two points 1 and 2 from a conductor carrying charge q is

(A) $\frac{q}{\pi \in} \ln \frac{D_2}{D_1}$
(B) $\frac{q}{4\pi} \ln \frac{D_2}{D_1}$
(C) $\frac{2q}{\pi \in} \ln \frac{D_2}{D_1}$
(D) $\frac{q}{2\pi \in} \ln \frac{D_2}{D_1}$

51. A 3-wire dc distribution makes ———— voltages available.

(A) one
(B) two
(C) three
(D) four

52. The cable size can be reduced by

(A) use of intersheaths only

(B) use of capacitance grading only

(C) use of both intersheaths and capacitance grading

(D) selecting insulation of very high dielectric strength

53. Bundled conductors in EHV transmission systems provide

(A) increased line reactance

(B) reduced line capacitance

(C) reduced voltage gradient

(D) increased corona loss

54. For complete protection of a 3-phase line

(A) Three-phase and three-earth fault relays are required

(B) Three-phase and two-earth fault relays are required

(C) Two-phase and two-earth fault relays are required

(D) Two-phase and one-earth fault relays are required

55. Transmission lines are transposed to

(A) reduce copper loss

(B) reduce skin effect

(C) prevent interference with neighbouring telephone lines

(D) prevent short circuit between any two lines

56. Possible faults that may occur on a transmission line are

1. 3-phase fault
2. L–L–G fault
3. L–L fault
4. L–G fault

The decreasing order of severity of the fault from the stability. Point of view is :

(A) 1–2–3–4

(B) 1–4–3–2

(C) 1–3–2–4

(D) 1–3–4–2

57. The typical value of short circuit ratio (SCR) for modern alternators is

(A) 1.5 per unit

(B) 1.2 per unit

(C) 1.0 per unit

(D) 0.5 per unit

58. In a common emitter amplifier, the un bypassed emitter resistor provides.

(A) current shunt feedback
(B) current series feedback
(C) voltage shunt feedback
(D) voltage series feedback

59. The switching speed is high for emitter-coupled logic because

(A) the transistors do not saturate
(B) negative logic used
(C) voltage compensated bias circuit
(D) multi-emitter transistors are used

60. The voltage gain of an amplifier without feedback and with negative feedback respectively are 100 and 20. Determine the percentage of negative feedback (β)

(A) 0.04
(B) 0.05
(C) –0.4
(D) 0.4

61. The diffusion capacitance of a forward biased P^+N^- (highly doped P-region) junction diode with a steady state current I depends on

(A) junction area
(B) mean life-time of the electrons
(C) mean life time of the holes
(D) width of the depleted region

62. When used in a circuit the Zener diode is always

(A) Forward biased
(B) Determined by Zener voltage
(C) Reverse biased
(D) Connected in series

63. Which of the following is not an essential element of a d.c power supply?

(A) Rectifier
(B) Filter
(C) Voltage regulation
(D) Voltage amplifier

64. A photo-diode is exposed to light with an illumination of 2.5 mW/cm^2. If the sensitivity of the photo-diode for the given conditions is 37.4 μA/mW/cm^2, calculate the reverse current through the device

(A) 14.96 μA
(B) 93.5 μA
(C) 66.84 mA
(D) 66.84 μA

65. Match the following :

(a)	RC coupling	1.	Regards common mode signal
(b)	Transformer coupling	2.	Frequency distortion
(c)	Direct coupling	3.	Higher voltage gain
(d)	Differential amplifier	4.	DC amplification

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

66. In a FET, the number of PN junctions at the sides are

(A) 2 (B) 3

(C) 4 (D) 5

67. The overlap angle of a phase controlled converter would increase on increasing the

I. Supply voltage

II. Supply frequency

III. Load current

IV. Source inductance

(A) I, II and III are correct (B) II, III and IV are correct

(C) I, II, IV are correct (D) I, III and IV are correct

68. A 3 phase semi converter can work as

(A) converter for $\alpha = 0$ to 180°

(B) converter for $\alpha = 0$ to 90°

(C) converter for $\alpha = 90$ to 180°

(D) converter for $\alpha = 0$ to 90° and inverter for $\alpha = 90$ to 180°

69. A single phase fully controlled bridge converter supplies a load drawing, a ripple free load current. If triggering angle is 30°, then the input power factor will be

(A) 0.65 (B) 0.78

(C) 0.85 (D) 0.866

70. Triac is equivalent to a

(A) Two SCRs connected in parallel

(B) Two SCRs connected in antiparallel

(C) One SCR and one diode connected in parallel

(D) Two diodes connected in antiparallel

71. An SCR triggered by a current pulse applied to the gate-cathode can be turned off.

(A) By applying pulse to the cathode

(B) By applying pulse to the anode

(C) By applying another pulse of opposite polarity to the gate-cathode

(D) By reversing the polarity of the anode and cathode voltage

72. Turn-ON and Turn-OFF times of transistor depend on

(A) Static charges

(B) Junction capacitance

(C) Current gain

(D) Source inductance

73. The snubber circuit used in thyristor circuits for

(A) Triggering

(B) $\frac{dv}{dt}$ protection

(C) $\frac{di}{dt}$ protection

(D) Both $\frac{dv}{dt}$ and $\frac{di}{dt}$ protection

74. A 220 V, 20 A, 1000 rpm separately excited DC motor has an armature resistance of 2.5 Ω. The motor is controlled by a step down chopper, with a frequency of 1 kHz. The input DC voltage to the chopper is 250 V. The duty cycle of the chopper for the motor to operate at a speed of 600 rpm delivering rate as torque will be

(A) 0.518

(B) 0.608

(C) 0.852

(D) 0.902

75. In an 8086 processor the instruction pointer contains 0080 H and the code segment register contains 0050. Then the 20-bit address of this instruction will be

(A) 00 500 H
(B) 00 580 H
(C) 00 850 H
(D) 00 058 H

76. The assembler is

(A) A compiler that translates statements from high-level language into assembly language
(B) A program that translates mnemonics into binary code
(C) An operating system that manages all the programs in the system
(D) A program that stores data

77. In pipelining for a C67x processor the maximum number of execute packets for a fetch packet is

(A) 4
(B) 8
(C) 16
(D) 32

78. In 8086 if a segment address contains a value 1234 H. Then the ending address of the 64 K segment is

(A) 22330 H
(B) 2233 F H
(C) 33220 H
(D) 3322 F H

79. If the 8085 adds 87 H and 79 H, specify the status of the S, Z and CY flags.

(A) S = 0; CY = 1; Z = 1
(B) S = 1; Z = 1; CY = 1
(C) S = 0; CY = 0; Z = 1
(D) S = 0; CY = 1; Z = 0

80. Find the 10-point DFT of the following sequence $x(n) = \delta(n) + \delta(n-5)$

(A) $X(k) = e^{-j\pi k}$
(B) $X(k) = (1 + e^{-j\pi k})$
(C) $X(k) = e^{j\pi k}$
(D) $X(k) = (1 - e^{-j\pi k})$

81. Two auxiliary parameters used to describe the pass band and stop band constraints of an analog low pass filter are

(A) $d = \frac{\varepsilon}{\sqrt{A^2 - 1}}$ and $k = \frac{\Omega_P}{\Omega_S}$
(B) $d = \frac{\sqrt{A^2 - 1}}{\varepsilon}$ and $k = \frac{\Omega_P}{\Omega_S}$
(C) $d = \frac{\varepsilon}{\sqrt{A^2 - 1}}$ and $k = \frac{\Omega_S}{\Omega_P}$
(D) $d = \frac{\sqrt{A^2 - 1}}{\varepsilon}$ and $k = \frac{\Omega_S}{\Omega_P}$

82. The part A of 8255 can be accessible when the pine A1 and A0 are

(A) A1 = 0; A0 = 0
(B) A1 = 0; A0 = 1
(C) A1 = 1; A0 = 0
(D) A1 = 1; A0 = 1

83. The length of byte count register in 8257 is

(A) 4 bits
(B) 8 bits
(C) 12 bits
(D) 16 bits

84. The internal program memory range of 8051 with active low EA signal high is

(A) 0000 – 00FF H
(B) 0000 – 0FFF H
(C) 0000 – FFFF H
(D) FF00 – FFFF H

85. In frequency multiplexing systems, if the subcarries frequency deviations are proportional to the center frequency, the scheme is referred to have

(A) a proportional bandwidth format
(B) a constant bandwidth format
(C) a variable bandwidth format
(D) a consistent bandwidth format

86. Which one of the following is a digital modulation technique?

(A) PAM – Pulse Amplitude Modulation
(B) PCM – Pulse Code Modulation
(C) PPM – Pulse Position Modulation
(D) PWM – Pulse Width Modulation

87. An audio signal is to be transmitted digital. Which is the system best suited for good fidelity

(A) 8 bit PCM
(B) 16 bit PCM
(C) 32 bit PCM
(D) PCM system with non uniform quantizer

88. A stack pointer is

(A) A 16-bit register in the microprocessor that indicates the beginning of the stack memory
(B) A register that decodes and executes 16-bit arithmetic expressions
(C) The first memory location where a subroutine address is stored
(D) A register in which flag bits are stored

89. The conversion efficiency of a solar cell unit fill factor FF can be calculated as

(A) P_{max} FF / $V_{OC}I_{SC}$

(B) $I_{SC}V_{OC}$ FF / P_{min}

(C) P_{min} / $I_{SC}V_{OC}$ FF

(D) $V_{SC}I_{OC}$ / P_{max} FF

90. Solar beam radiation is measured using

(A) Anemometer

(B) Thermometer

(C) Sunshine recorder

(D) Pyrheliometer

91. Undercharging of a battery

(A) Reduces specific gravity of the electrolyte

(B) Increases specific gravity of the electrolyte

(C) Produces excessive gassing

(D) Increases the temperature

92. "The mass of an ion liberated at an electrode is directly proportional to the quantity of electricity".

The above statement is associated with

(A) Newton's law

(B) Faraday's law of electromagnetics

(C) Faraday's law of electrolysis

(D) Gauss's law

93. The output voltage V_0 of a buck converter is related to the duty cycle D as

(A) $V_0 = V_{in} \times D^2$

(B) $V_0 = V_{in} \times D$

(C) $V_0 = V_{in} / D$

(D) $V_0 = V_{in} / D^2$

94. A 10 Ah battery discharged by 2 Ah has

(A) a state of charge of 20% and a depth of discharge of 80%

(B) a state of charge of 80% and a depth of discharge of 20%

(C) a state of charge of 80% and a depth of discharge is 80%

(D) a state of charge of 20% and a depth of discharge is 20%

95. The main consistent of LPG is

(A) Methane

(B) Butane

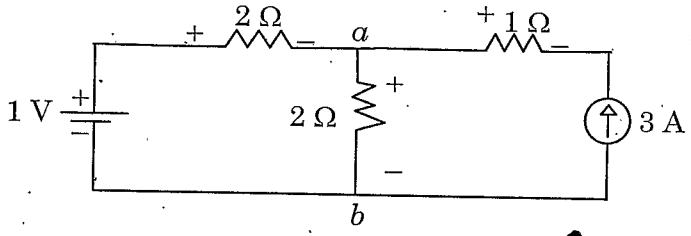
(C) Hydrogen

(D) Nitrogen

96. Mesh analysis is applicable only for the network which are ———— in nature

(A) Polar
(B) Planer
(C) Non-polar
(D) Non-planer

97. In the circuit given below determine V_{ab}



(A) 2.5 V
(B) 3.5 V
(C) 7 V
(D) 5 V

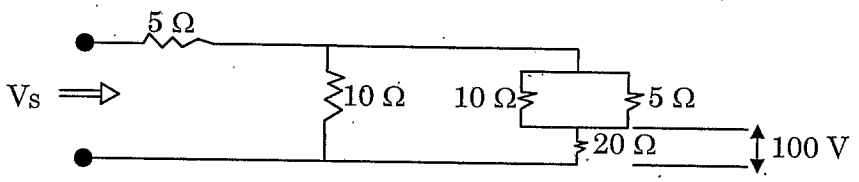
98. Two resistances are connected in parallel and each dissipates 40 W. The total power supplied by the source equals

(A) 80 walts
(B) 40 walts
(C) 160 walts
(D) 20 walts

99. Norton's theorem results in

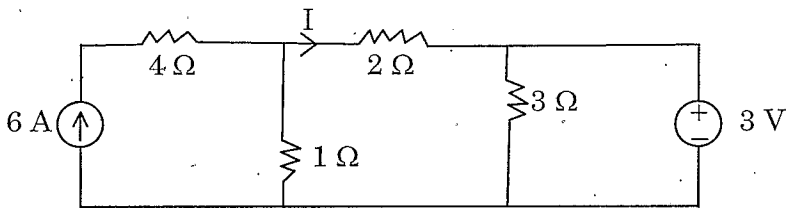
(A) A voltage source with impedance is parallel
(B) A current source with an impedance in parallel
(C) A voltage source alone
(D) A current source alone

100. In the circuit given below the voltage across 20Ω resistor is 100 V. What is the total voltage Vs across the combined circuit?



(A) 100 V
(B) 10 V
(C) 20 V
(D) 200 V

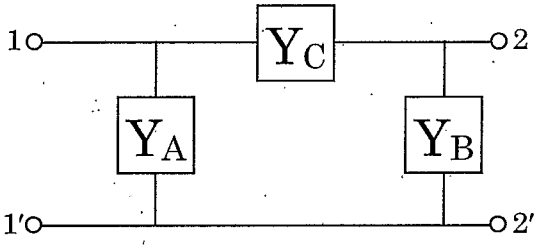
101. For the circuit shown in figure, the current I is



(A) 3 A (B) 2 A

(C) 1 A (D) 0 A

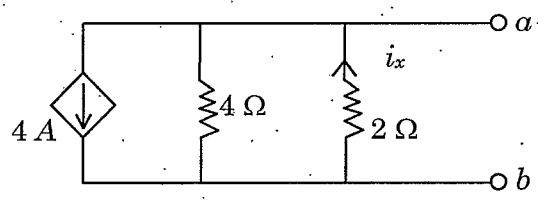
102. For the two port network shown in Fig, Y_{12} is



(A) $Y_A + Y_B$ (B) $Y_C + \left(\frac{Y_A Y_B}{Y_A + Y_B}\right)$

(C) $-Y_C$ (D) Y_C

103. The Therenin's voltage across the terminal ab of the circuit is



(A) 1 V (B) 2 V

(C) 0 V (D) ∞

104. In a source free RLC circuit (series), if the neper frequency is greater than undamped natural frequency, then the response is

(A) Over damped
(B) Under damped
(C) Critically damped
(D) Oscillatory

105. In a source free RLC parallel circuit , $R = 4\Omega$, $L = 8\,H$, $C = \frac{1}{2}F$. The natural response is

(A) Over damped
(B) Critically damped
(C) Under damped
(D) Oscillatory

106. The phasor domain representation of $V_m \cos(wt + \phi)$ and $V_m \sin(wt + \phi)$ are respectively

(A) $V_m \angle \phi$ and $V_m \angle \phi - 90$
(B) $V_m \angle \phi - 90$ and $V_m \angle \phi$
(C) $V_m \angle \phi$ and $V_m \angle \phi + 90$
(D) $V_m \angle \phi + 90$ and $V_m \angle \phi$

107. Admittance of elements R, L and C respectively are

(A) $R, jw_L, \frac{1}{jw_C}$
(B) $R, \frac{1}{jw_L}, jw_C$
(C) $\frac{1}{R}, jw_L, \frac{1}{jw_C}$
(D) $\frac{1}{R}, \frac{1}{jw_L}, jw_C$

108. The current following in a capacitor is called

(A) Conduction current
(B) Linear current
(C) Displacement current
(D) Constant current

109. Intrinsic impedance of free space

(A) 75 Ω
(B) 73 Ω
(C) 300 Ω
(D) 377 Ω

110. What will be the current passing through the ring shaped air cored coil when number of turns is 800 and ampere turns are 2400?

(A) 6 A
(B) 1.5 A
(C) 12 A
(D) 3 A

111. What does the equation $1/2\,\vec{J}.\vec{A}$ represent?

(A) Electric energy density

(B) Magnetic energy density

(C) Power density

(D) Radiation resistance

112. Point charges – 10 nc and 10 nc and located in free space at $(-1, 0, 0)m$ and $(1, 0, 0)m$ respectively. What is energy stored in the field?

(A) 0

(B) 450 nJ

(C) –450 nJ

(D) –900 nJ

113. Which of the following is zero as applied to electro magnetic fields?

(A) *grad div* $\vec{A}$

(B) *Div grd* $\vec{A}$

(C) *Div curl* $\vec{A}$

(D) *curl curl* $\vec{A}$

114. Energy stored in a coil is doubled when current is increased by

(A) 100%

(B) 41.4%

(C) 50%

(D) 35%

115. Magneto striation is a phenomenon of

(A) Generation of electricity in ferromagnetic materials

(B) Generation of magnetism in conductors

(C) Change in permeability of ferromagnetic materials

(D) Change in physical dimension of ferromagnetic materials during magnetisation

116. Which one of the following is not Maxwell's equation for a static electro magnetic field in a linear homogeneous medium?

(A) $\nabla.\vec{B} = 0$

(B) $\nabla.\vec{D} = 0$

(C) $\oint_C \vec{B}.d\vec{l} = \mu_0 I$

(D) $\nabla^2\vec{A} = \mu_0\vec{J}$

117. The inductance of a long solenoid with length 1000 mm would with 3000 turns on a cylindrical paper tube 60 mm diameter is

(A) 3.2 μH (B) 3.2 mH

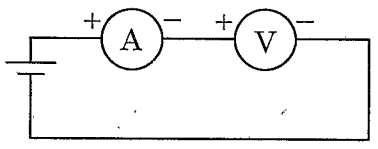
(C) 32 mH (D) 3.2 H

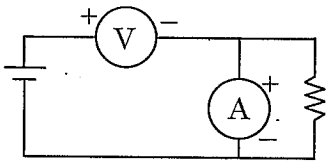
118. It a moving Iron type ammeter is connected in a circuit and we interchange its connection, then,

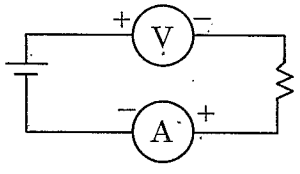
(A) It will give no deflection (B) Its reading will not change

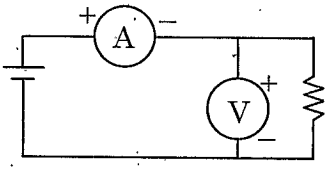
(C) It will deflect in opposite direction (D) It will burn out

119. In which of the circuits and the ammeters and the voltmeters connected

a. 

b. 

c. 

d. 

(A) circuit a (B) circuit b

(C) circuit c (D) circuit d

120. The simplest and most convenient form of detector used in a wheat stone bridge for audio frequency range is

(A) Galvanometer (B) Vibration Galvanometer

(C) Pair of Head phones (D) Cathode Ray tube Indication

121. Harmonic distortion analyzer is used to

(A) Measure the amplitude of each harmonic

(B) Measure RMS value of fundamental frequency component

(C) Measure all harmonics except fundament frequency component

(D) Display RMS value of each harmonic on CRO

122. Maxwell's inductance – capacitance bridge is used to measure

(A) Very low Q coils $(Q<1)$

(B) Low Q coils $(1<Q<10)$

(C) Medium Q coils $(Q=0)$

(D) High Q coils $(Q>10)$

123. In a a.c bridge opposite arms Z_b and Z_c are $300\angle -90^\circ$ and $200\angle 0^\circ$ respectively. The other arm Z_a is given as $100\angle +50^\circ$. For balanced condition Z_d will be

(A) $600\angle -40^\circ$

(B) $600\angle 140^\circ$

(C) $600\angle -140^\circ$

(D) $150\angle 14^\circ$

124. The damping torque in a measuring instrument can be produced by

(A) Eddy current

(B) Gravity control

(C) Electro statically

(D) Thermally

125. Megger is used for testing

(A) Open circuit only

(B) Short circuit only

(C) Both open, short circuits, earth resistance and insulation

(D) Low resistances only

126. Creeping in energy meter can be prevented by providing

(A) One hole on the disc

(B) Two holes on opposite side of the disc

(C) Extra voltage coil in the meter

(D) By a magnet

127. In two watt meter method of 3 phase power measurement when does one watt meter read negative?

(A) When power factor is unity

(B) When power factor is 0.5

(C) When power factor is less than 0.5

(D) When power factor is greater than 0.5 and less than unity

128. In an open loop control system, which of the following is not present?
(A) Comparator
(B) Controller
(C) Actuator
(D) Reference

129. ———— can be extended to systems which are time-varying
(A) Bode-Nyquist stability methods
(B) Transfer functions
(C) Root locus design
(D) State model representatives

130. In a stable control system, saturation can cause
(A) low-level oscillations
(B) high- level oscillations
(C) conditional stability
(D) over damping

131. Which of the following device is used for conversion of co-ordinates?
(A) Microsyn
(B) Selsyn
(C) Synchro-resolver
(D) Synchro-transformer

132. AC servomotor resembles
(A) Two phase induction motor
(B) Three phase induction motor
(C) Direct current series motor
(D) Universal motor

133. The frequency and time domain are related through
(A) Laplace Transform and Fourier Integral
(B) Laplace Transform
(C) Fourier Integral
(D) Nyquist criterion

134. The unit step response of the system is $1-e^{t}(1+t)$ The system is
(A) Unstable
(B) Stable
(C) Critically stable
(D) Stability depends upon the input

135. The system with characteristic equation $S^3+KS^2+9S+18=0$ has capability to have sustained oscillations. Then the value of K and frequency of sustained oscillation w_n are respectively
(A) 4, 5
(B) 4, 6
(C) 2, 3
(D) 2, 5

136. In case of type-1 system, steady state acceleration is

(A) unity (B) infinity

(C) zero (D) 10

137. A control system is defined by the following mathematical relationship $\frac{d^2x}{dt^2}+6\frac{dx}{dt}+5x=12\,(1-e^{-2t})$. The response of the system as $t\to\alpha$ is

(A) $x=6$ (B) $x=2$

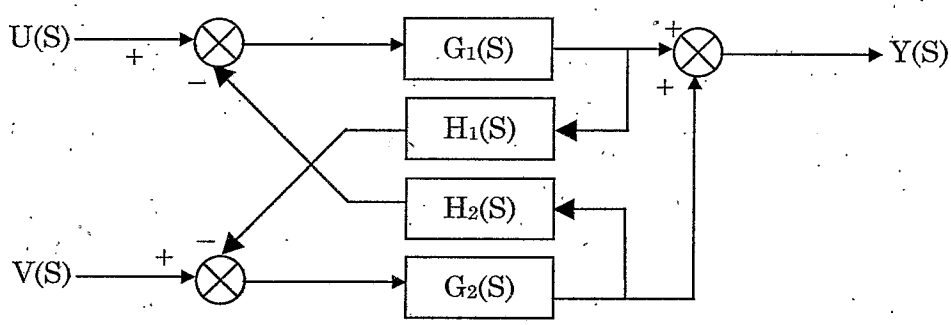
(C) $x=2.4$ (D) $x=-2$

138. The transfer function of a system is given as $\frac{100}{s^2+20s+100}$. This system is

(A) an over damped system (B) an under damped system

(C) a critically damped system (D) an unstable system

139. For the block diagram shown, the ratio Y(s)/U(s)



(A) $\frac{G_1(1+H_1G_2)}{1-G_1H_2G_2H_1G_1}$ (B) $\frac{G_1(1-H_1G_2)}{1-G_1H_2\,G_2\,H_1G_1}$

(C) $\frac{G_1(1-H_1G_2)}{1+G_1H_2G_2H_1G_1}$ (D) $\frac{G_1(1+H_1G_2)}{1+G_1H_2G_2H_1G_1}$

140. A, 10 pole 25 Hz alternator is directly coupled to and is driven by 60 Hz synchronous motor. Then the number of poles in a synchronous motor are

(A) 12 poles
(B) 48 poles
(C) 24 poles
(D) 6 poles

141. Match column I with column II and select the correct answer

	Column I		Column II
(a)	Interpoles	1.	Lap winding
(b)	Three point starter	2.	DC machine commutation
(c)	Dummy coils	3.	DC shunt motor
(d)	Equalising ring	4.	Wave winding

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

142. The synchronous speed of linear induction motor depends on

(A) Width of the pole pitch
(B) No. of poles
(C) Supply frequency
(D) Both (A) and (C)

143. The starting torque can be obtained in case of single phase induction motor with identical main and auxillary windings, by connecting

(A) A capacitors across the mains
(B) A capacitor in series with the machine
(C) A capacitor in series with the auxillary winding
(D) The main and auxillary winding in series

144. A 6-pole, 50 Hz, $3-\phi$ induction motor is running at 950 rpm and has rotor copper loss of 5 kW. Its rotor input is ———— kW

(A) 100
(B) 10
(C) 95
(D) 5.3

145. In a 100 KVA, 1100/220 V, 50 Hz single phase transformer with 2000 turns on high voltage side, the open circuit test result gives 220 V, 91 A, 5 kW on low voltage side. The core component of current is approximately.

(A) 9.1 A
(B) 22.7 A
(C) 45 A
(D) 91 A

146. For a 'P' pole machine, the relation between electrical and mechanical degree is

(A) $\theta_{elec} = \frac{2}{P}\theta_{mech}$
(B) $\theta_{elec} = \frac{4}{P}\theta_{mech}$
(C) $\theta_{elec} = \theta_{mech}$
(D) $\theta_{elec} = \frac{P}{2}\theta_{mech}$

147. Why is the armature core of a dc machine laminated?

(A) to reduce hysteresis loss
(B) to reduce eddy current loss
(C) to improve voltage regulation
(D) to reduce armature reaction

148. A 50 kW, 200 V DC stunt motor has armature resistance of 1 Ω and shunt field resistance of 100 Ω. At no load, the motor draws 6 A from 200 V supply and runs at 1000 RPM. What is the total copper loss of the machine?

(A) 400 W
(B) 16 W
(C) 36 W
(D) 416 W

149. The residual magnetism of a self excited dc generator is lost. To build up its emf again the

(A) field winding must be replaced
(B) armature connection must be reversed
(C) field winding connections must be reversed
(D) field winding must be excited by low voltage dc supply

150. The speed control of DC shunt motor in both the directions can be obtained by

(A) Armature resistance control method
(B) Ward Leonard method
(C) Field diverter method
(D) Armature voltage control method

151. In a short line, the regulation at leading power factor is

(A) $IR\cos\phi_r + IX\sin\phi_r$

(B) $IX\cos\phi_r + IR\sin\phi_r$

(C) $IR\cos\phi_r - IX\sin\phi_r$

(D) $IX\cos\phi_r - IR\sin\phi_r$

152. A 20,000 kVA transformer with 10% reactance will have a reactance of ———— at 10,000 kVA base.

(A) 10%

(B) 20%

(C) 15%

(D) 5%

153. The sequence components of voltages for a balanced line-to-neutral voltages are $\begin{bmatrix} V_{an} \\ V_{bn} \\ V_{cn} \end{bmatrix} = \begin{bmatrix} 220\angle 0^\circ \\ 220\angle -120^\circ \\ 220\angle 120^\circ \end{bmatrix} kV$ then, V_0, V_1 and V_2 are?

(A) $V_0 = 0\ kV$, $V_1 = 220\angle 0^\circ\ kV$, and $V_2 = 0\,kV$

(B) $V_0 = 220\ kV$, $V_1 = 220\angle 120^\circ\ kV$, and $V_2 = 0\,kV$

(C) $V_0 = 0\ kV$, $V_1 = 0\ kV$, and $V_2 = 0\ kV$

(D) $V_0 = 120\angle 0^\circ\ kV$, $V_1 = 0\,kV$, and $V_2 = 120\angle 0^\circ\ kV$

154. A 2 pole, 50 Hz, 11 kV synchronous generator with a rating of 120 MW and 0.87 lagging power factor has a moment of inertia of 12000 kg–m^2. The constants H and M are

(A) H = 4.2933 MJ/MVA and M = 0.0658 MJs/elec. degree

(B) H = 0.0658 MJ/MVA and M = 4.2933 MJs/elec. degree

(C) H = 4.2933 MJs/elec. degree and M = 0.0658 MJ/MVA

(D) H = 0.0658 MJs/elec. degree and M = 4.2933 MJ/MVA

155. The phase comparators in case of static relays and electro-mechanical relays normally are

(A) sine and cosine comparators respectively

(B) cosine and sine comparators respectively

(C) both are cosine comparators

(D) both are sine comparators

156. The capacity factor of a plant is equal to

(A) maximum load/average load
(B) average load/maximum load
(C) maximum load/plant capacity
(D) average load/plant capacity

157. Large size steam power plants and nuclear plants are suitable for

(A) base loads
(B) intermediate loads
(C) peak loads
(D) both base and peak loads

158. The function of economiser is to

(A) heat the feed water using exhaust steam
(B) heat the feed water using exhaust gases
(C) heat the incoming air using exhaust gases
(D) heat the cooling water using exhaust steam

159. Which of the logic family exhibit relatively higher power dissipation per gate?

(A) TTL
(B) ECL
(C) CMOS
(D) NMOS

160. Using 10's complement, subtract : (52532–3250)

(A) 49282
(B) 149282
(C) 58578
(D) 161828

161. Convert $(0.6875)_{10}$ to binary

(A) $(1.0100)_2$
(B) $(0.1011)_2$
(C) $(1.1011)_2$
(D) $(0.0100)_2$

162. The simplified form of the Boolean function $Y = \overline{A}B\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + AB\overline{C}$

(A) $\overline{C}$
(B) C
(C) $\overline{AB}$
(D) AB

163. The voltage gain of the CE amplifier

(A) Rc/Re
(B) –Rc/Re
(C) Re/Rc
(D) –Re/Rc

164. The operating frequency of a Wien-Bridge oscillator is given by

(A) $\frac{1}{2\pi\sqrt{LC}}$ (B) $\frac{1}{2\pi RC}$

(C) $\frac{1}{4\pi\sqrt{LC}}$ (D) $\frac{1}{29RC}$

165. The group of bits 11001 is serially shifted into a 5-bit parallel output shifter with initial state 01110. After three clock pulses the register will contain

(A) 01110 (B) 00001

(C) 00101 (D) 00110

166. The number of control lines in a 8 to 1 multiplexer is

(A) 1 (B) 3

(C) 4 (D) 8

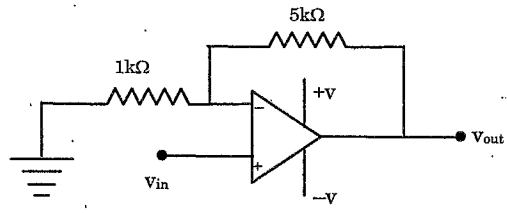
167. How many flip-flops will be complemented in a 10-bit binary ripple counter to reach the next count after the following count?

0111111111

(A) 5 (B) 10

(C) 1 (D) 9

168. For the non-inverting amplifier circuit shown the input voltage is 2 V peak to peak. Find the peak to peak output voltage



(A) 10 (B) 12

(C) 6 (D) 18

169. Give the number of bytes stored in the memory unit of size $2T \times 8$

(A) 2^{41} (B) 2^{40}

(C) 2^{31} (D) 2^{30}

170. In a three phase half wave rectifier, the output voltage is equal to

(A) The most positive input phase voltage at any instant

(B) The difference of most positive and most negative input phases at any instant

(C) The average value of the three phase voltages

(D) The difference of the two positive phase voltages

171. The DC battery is charged from its internal EMF 140 V to 170 V from a 300 V DC source. The battery has internal resistance of 1 Ω. For a constant charging current of 10 A, the range of duty cycle is

(A) 0.5 to 0.6

(B) 0.45 to 0.6

(C) 0.5 to 0.65

(D) 0.45 to 0.65

172. A half controlled single phase bridge rectifier is supplying an RL load. It is operated at a firing angle α and the load current is continuous. The fraction of cycle that the free wheeling diode conduct is

(A) $\frac{1}{2}$

(B) $1-\frac{\alpha}{\pi}$

(C) $\frac{\alpha}{2\pi}$

(D) $\frac{\alpha}{\pi}$

173. A single phase inverter has square wave output voltage. What is the percentage of the 5^{th} harmonic component is relation to the fundamental component?

(A) 40%

(B) 30%

(C) 20%

(D) 10%

174. To convert a VSI (Voltage Source Inverter) into a CSI (Current Source Inverter) insert a large

(A) Inductor in series with DC supply

(B) Capacitor in parallel with DC supply

(C) Inductor in parallel with DC supply

(D) Capacitor in series with DC supply

175. In a three phase voltage source inverter operating in square wave mode, the output voltage will be free from

(A) 3^{rd} harmonic

(B) 7^{th} harmonic

(C) 11^{th} harmonic

(D) 13^{th} harmonic

176. Match :

(Sections of a power supply) List I		Elements used List II
(a)	Reference sources	1. Op amp
(b)	Error detector	2. BJT
(c)	Control devices	3. Zener diode
(d)	Current limit	4. Short circuit protection

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

177. Most suitable device for high frequency inversion in SMPS is

(A) BJT (B) IGBT

(C) MOSFET (D) GTO

178. Inverter fed induction motor can be shifted from motoring to regenerative braking by

(A) Reverse phase sequence (B) Decreasing inverter frequency

(C) Reducing inverter volume (D) Increasing inverter frequency

179. A four quadrant chopper cannot be operated as

(A) one quadrant chopper (B) cyclo converter

(C) inverter (D) bidirectional rectifier

180. In the sinusoidal pulse width modulation scheme, if the zero of the triangle wave coincides with zero of the reference sinusoidal, then the number of pulses per half cycle is

(A) $\frac{f_0}{2f}$ (B) $\left(\frac{f_c}{2f}\right)+1$

(C) $\frac{2fc}{f}$ (D) $\frac{fc}{2f}-1$

181. In a single phase full wave AC voltage regulator, if the firing angle is varied from 0 to 180°, the rms output voltage can be varied from

(A) Vs to 0.25 Vs (B) Vs to 0.5 Vs

(C) Vs to 1.5 Vs (D) Vs to 0

182. The following system $y(t) = x(t)\cos(100\pi t)$ is

(A) Dynamic, linear, time variant, casual and non stable

(B) Static, linear, time variant, casual and stable

(C) Static, linear, time invariant, non casual, stable

(D) Dynamic, nonlinear and time variant, casual and non stable

183. The Fourier transform of $x(n) = a^n u(n)$ for $-1 < a < 1$ is

(A) $X(w) = 1 - ae^{-jw}$

(B) $X(w) = \dfrac{-1}{1 - ae^{-jw}}$

(C) $X(w) = \dfrac{a}{1 - ae^{-jw}}$

(D) $X(w) = \dfrac{e^{-jw}}{1 - ae^{-jw}}$

184. A signal is sampled at Nyquist rate $f_s = 2f_0$. The function can be record from its samples only if it is a

(A) Periodic square wave with fundamental frequency, f_0

(B) Periodic sine wave with fundamental frequency, f_0

(C) Periodic triangular wave with fundamental frequency, f_0

(D) Periodic saw tooth wave with fundamental frequency, f_0

185. The number of address lines input to 8259 is

(A) 1

(B) 2

(C) 4

(D) 8

186. RL7-RL0 lines of 8279 chip refer to

(A) the data bus

(B) the outputs that send data for display

(C) the inputs for sensing a key depression

(D) the scan lines for keyboard and display

187. Programming the 8253 in mode 3 and loading a count N results in

(A) Single interrupt signal generation when count becomes zero

(B) Square wave output with high for N clocks and low for N clocks

(C) Square wave output with high for $\dfrac{N}{2}$ clocks and low for $\dfrac{N}{2}$ clocks

(D) Square wave output with high for $\dfrac{(N+1)}{2}$ clocks and low for $\dfrac{(N-1)}{2}$ clocks

188. A fuel cell in order to produce electricity burns

(A) Helium (B) Nitrogen

(C) Hydrogen (D) Lithium

189. Lignite, bituminous and anthracite are different ranks of

(A) Nuclear fuel (B) Coal

(C) Biogas (D) Natural gas

190. The power extracted by the wind blades during upstream is

(A) $P = \frac{1}{2} C_P A \rho V^3$ (B) $P = 2 C_P A \rho V^3$

(C) $P = \frac{1}{2} C_P A \rho V^2$ (D) $P = 2 C_P A \rho V^2$

191. The cut-out speed of a wind turbine is from

(A) 25 m/s to 40 m/s (B) 30 m/s to 60 m/s

(C) 40 m/s to 60 m/s (D) 40 m/s to 80 m/s

192. Which of the following is not a part of a modern wind turbine?

(A) Compressor (B) Gearbox

(C) Nacelle (D) Yaw drive

193. The amount of energy available in the wind at any instant is proportional to _____ of the wind speed.

(A) Square root (B) Square

(C) Half (D) Qube

194. In solar radiation the angle made by the plane surface with the horizontal

(A) Azimuth angle
(B) Slope
(C) Zenith angle
(D) Declination angle

195. Solar constant is

(A) 1.14 w/m^2
(B) 1.4 w/m^2
(C) 1.4 kw/m^2
(D) 1.4 mw/m^2

196. NASA standard value for solar constant

(A) 1353 Watts/sq.m
(B) 116.5 Watts/sq.m
(C) 13.53 kw/sq.m
(D) 0.116 kw/sq.m

197. What is the maximum possible output of a solar array?

(A) 500 w/m^2
(B) 250 w/m^2
(C) 500 kw/m^2
(D) 250 mw/m^2

198. If the angle of refraction into a medium is $\geq$ the critical angle of refraction

(A) there will be 100% reflection and 0% refraction
(B) there will be 0% reflection and 100% refraction
(C) there will be 50% reflection and 50% refraction
(D) there will be 25% reflection and 75% refraction

199. The typical value of the fill factor for a good silicon cell

(A) 1
(B) 0.8
(C) 0.6
(D) 0.5

200. Freshel's equations relate

(A) The magnitude of incident waves and power generated
(B) The magnitude of incident, reflected and refracted waves
(C) The magnitude of reflected waves and temperature
(D) The magnitude of refracted waves and power generated

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