Sl. No. : [redacted]

CEEE/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.

SPACE FOR ROUGH WORK

1. When two 2-port network are connected in parallel, it is convenient to use

(A) Open circuit impedance parameters (B) Short circuit impedance parameters

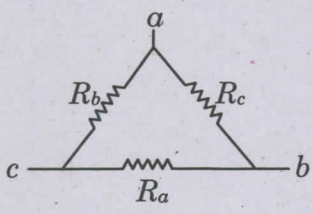
(C) Z parameters (D) Y parameters

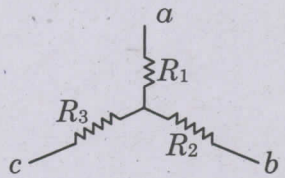
2. In a RLC series circuit, the impedance at resonance is

(A) Zero (B) R

(C) Infinity (D) $\frac{L}{CR}$

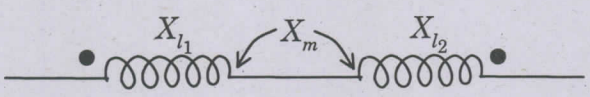
3. In fig. 1 R_a, R_b and R_c are 20 Ω, 10 Ω and 10 Ω respectively. The resistances R_1, R_2 and R_3 in Ω of an equivalent star-connection are





(A) 2.5, 5, 5 (B) 5, 2.5, 5 (C) 5, 5, 2.5 (D) 2.5, 5, 2.5

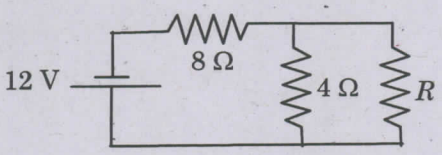
4. The equivalent inductance of two coils A and B connected as in the figure given below.



(A) $X_{l_1} + X_{l_2} - 2X_m$ (B) $X_{l_1} + X_{l_2} + X_m$

(C) $X_{l_1} + X_{l_2} - X_m$ (D) $X_{l_1} + X_{l_2} + 2X_m$

5. What shall be the value of R, if it has to absorb maximum power from source?



(A) $\frac{3}{8}\Omega$ (B) $\frac{8}{3}\Omega$ (C) 4 Ω (D) 8 Ω

6. Which of the following theorems is a manifestation of the law of conservation of energy?

(A) Reciprocity theorem
(B) Thevenin's theorem
(C) Tellegen's theorem
(D) Norton's theorem

7. The Norton's equivalent circuit shown in the figure II is drawn from figure I. The value of I_{SC} and R_{eq} in the fig. II is

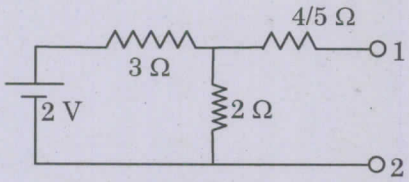


Fig. I

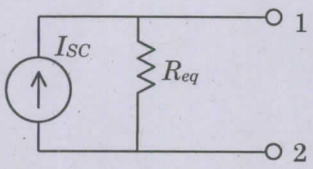


Fig. II

(A) 5/2 A and 2 Ω
(B) 2/5 A and 1 Ω
(C) 4/5 A and 12/5 Ω
(D) 2/5 A and 2 A

8. Match List I with List II.

	List I (Condition)		List II (Transient response)
(a)	$R = 0$	1.	Undamped oscillations
(b)	$R < 2\sqrt{L/C}$	2.	Damped oscillations
(c)	$R = 2\sqrt{L/C}$	3.	Critically damped response
(d)	$R > 2\sqrt{L/C}$	4.	Non-oscillatory response

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

9. In a RLC series circuit, $R = 8\ \Omega$, $L = 4$ H, $C = \frac{1}{4}$ F. The natural response is

(A) over damped
(B) under damped
(C) critically damped
(D) oscillatory

10. The characteristics impedance of lossless transmission line is given by

(A) $\sqrt{C/L}$ (B) $\sqrt{LC}$ (C) $\sqrt{L/C}$ (D) $1/\sqrt{LC}$

11. Image theory is applicable to problem involving

(A) Electro static field only

(B) Magneto static field only

(C) Both electro static and magneto static fields

(D) Neither electro static nor magneto static fields

12. The relation between electric intensity E, voltage applied V and the distance between the plates of a parallel plate capacitor is

(A) $E = V/d$ (B) $E = V \times d$ (C) $E = V/d^2$ (D) $E = V \times d^2$

13. Which one of the following is true for the value of capacitance between two spheres, whose separation is very much larger than their radii R?

(A) $\frac{2\pi}{\epsilon_0 R}$ (B) $2\pi\epsilon_0 R$ (C) $\frac{2\pi\epsilon_0}{R}$ (D) $\frac{4\pi\epsilon_0}{R}$

14. The inductance of a solenoid of 10 turns is 5 μH. Which one of the following is correct value of inductance when the number of turns is 20 and length is doubled?

(A) 10 μH (B) 20 μH (C) 40 μH (D) 5 μH

15. Consider the following three equations :

1. $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$

2. $\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$

3. $\nabla \times \vec{B} = 0$

Which of the above are Maxwell's equations?

(A) 1, 2 and 3 (B) 1 and 2 only

(C) 2 and 3 only (D) 1 and 3 only

16. The expression $A + (B \cdot C)$

(A) $A \cdot B + C$ (B) $A \cdot B + A \cdot C$

(C) A (D) $(A + B) \cdot (A + C)$

17. To reduce temperature error in shunted ammeter, swamping resistance is connected _____.

(A) in series with the shunt

(B) in parallel with the shunt

(C) in series with the meter

(D) in between shunt and the meter

18. The principle of voltage to time conversion is used in

(A) Dual slope type DVM

(B) Successive approximation type DVM

(C) Integrating type DVM

(D) Continuous balance DVM

19. The turn off time of a LCD is in the order of

(A) 1 S (B) 1 mS

(C) 10 mS (D) 10 nS

20. An oscilloscope indicates

(A) RMS value (B) Average value

(C) Peak to peak value (D) DC value

21. Schmitt trigger used in digital measurement of time converts the input into

(A) Square wave (B) Sine wave

(C) Pulses (D) Sawtooth wave

22. The gauge factor in a strain gauge is defined as (L - length, D - diameter, R - resistivity, ρ - resistivity)

(A) $\frac{\Delta L/L}{\Delta R/R}$ (B) $\frac{\Delta R/R}{\Delta L/L}$

(C) $\frac{\Delta R/R}{\Delta D/D}$ (D) $\frac{\Delta R/R}{\Delta \rho/\rho}$

23. Harmonic distortion is due to

(A) Linear behaviour of the circuit elements

(B) Non linear behaviour of the circuit elements

(C) Change in behaviour of circuit elements due to temperature

(D) Due to circuit resistance

24. A Varmeter is used to indicate the

(A) overloads

(B) out of phase

(C) reactive power

(D) real power

25. In two wattmeter method of measuring 3-phase power factor is 0.5, then one wattmeter will read

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

(B) zero

(C) $\sqrt{2}w$

(D) $\frac{w}{\sqrt{3}}$

26. Moving iron instruments are

(A) Attraction type

(B) Repulsion type

(C) Attraction and repulsion type

(D) Dynamometer type

27. If σ is standard deviation, variance is

(A) $\sqrt{\sigma - 1}$

(B) $(\sigma)^{1.5}$

(C) σ^2

(D) $(\sigma)^{1/2}$

28. Calculate the sensitivity of a $200\,\mu A$ meter movement which is to be used as a dc voltmeter.

(A) 5000 KΩ/V

(B) 500 KΩ/V

(C) 50 KΩ/V

(D) 5 KΩ/V

29. Which of the following statements is not necessarily correct for open control system?

(A) Input command is the sole factor responsible for providing the control action

(B) Presence of non-linearities causes malfunctioning

(C) Less expensive

(D) Generally free from problems of non-linearities

30. Which of the following is a reason to employ negative feedback in most automatic control systems?

(A) $G_C < G$ (B) $G_C > G$

(C) It results in stable output (D) It results in unstable output

31. The loop gain GH of a closed loop systems is given by the expression $\frac{K}{s(s+2)(s+4)}$ the value of K for which the system just becomes unstable is

(A) $K = 6$ (B) $K = 8$

(C) $K = 48$ (D) $K = 96$

32. The Asymptotes in the root locus plot of unit feed back configuration of $G(s) = \frac{1}{s(s+1)(s+2)}$ intersect with the real axis at

(A) -1.25 (B) -1.5

(C) -1 (D) -1.15

33. Which of the following is the full form of SISO?

(A) Single input single output (B) Sustained input sustained output

(C) Steady input steady output (D) Sequential input sequential output

34. A unity feedback system having open loop gain $G(s)1+(s) = \frac{k(1-s)}{(1+s)}$ becomes stable when

(A) $|k| > 1$ (B) $k > 1$ (C) $|k| < 1$ (D) $k < -1$

35. The first two rows of Routh's tabulation of a third order equation are as follows :

s^3	2	2
s^2	4	4

This means there are

(A) Two roots at $s = \pm j$ and one root in right half s plane

(B) Two roots at $s = \pm j2$ and one root in left half of s plane

(C) Two roots at $s = \pm j2$ and one root in right half of s plane

(D) Two roots at $s = \pm j$ and one root in left half of s plane

36. Which of the following does not define a transfer function of a closed loop control system?

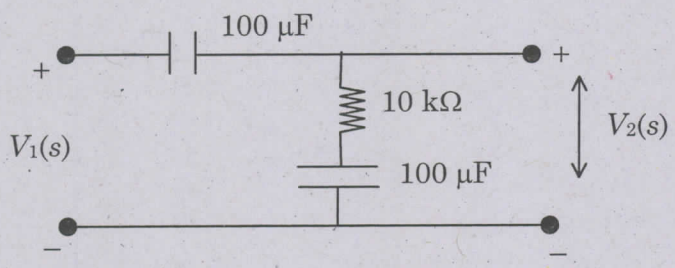
(A) It is a ratio of actual output to the referred output

(B) It is a ratio of actual output to the actual input

(C) It has magnitude only

(D) It has phase only

37. The transfer function $\frac{V_2(s)}{V_1(s)}$ of the circuit shown in Fig. is



(A) $\frac{0.5s+1}{s+1}$

(B) $\frac{3s+6}{s+2}$

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

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

38. How can the reactive power delivered by a synchronous generator be controlled?

(A) By changing the prime mover input

(B) By changing the excitation

(C) By changing the direction of rotation

(D) By changing the prime mover speed

39. With the load power factor of unity, the effect of armature reaction on the main field flux of an alternator is

(A) Distortional

(B) Magnetizing

(C) Demagnetizing

(D) Nominal

40. In the 'V' curve of a synchronous motor, the 'x' axis parameter and 'y' axis parameter are respectively.

(A) Armature current and field current

(B) Power factor and field current

(C) Armature current and torque

(D) Field current and armature current

41. A 4 pole, 50 Hz, 3ϕ induction motor has blocked rotor reactance per phase that is four times the rotor resistance per phase. The speed at which the maximum torque developed is

(A) 1500 rpm
(B) 1125 rpm
(C) 1000 rpm
(D) 3000 rpm

42. In an induction motor if the air gap is increased

(A) speed will reduce
(B) efficiency will improve
(C) power factor will be lowered
(D) breakdown torque will reduce

43. In an induction motor, what is the ratio of the rotor copper loss and rotor input?

(A) $\frac{1}{s}$
(B) s
(C) $1-s$
(D) $\frac{s}{1-s}$

44. Two transformers A and B having equal outputs and voltage ratios but unequal percentage impedances of 4 and 2 are operating in parallel. Transformer A will be running over-load by _____ percent.

(A) 50
(B) 66
(C) 33
(D) 25

45. The voltage applied to the h.v. side of a transformer during short-circuit test is 2% of its rated voltage. The core loss will be _____ percent of the rated core loss.

(A) 4
(B) 0.4
(C) 0.25
(D) 0.04

46. Which three phase connection can be used in a transformer to introduce a phase difference of 30° between its output and corresponding input line voltages?

(A) Star-Delta
(B) Star-Star
(C) Delta-Delta
(D) Delta-Zigzag

47. What is the load at which maximum efficiency occurs in case of a 100 kVA transformer with iron loss of 1 kW and full load copper loss of 2 kW?

(A) 100 kVA
(B) 70.7 kVA
(C) 50.5 kVA
(D) 25.2 kVA

48. Surge impedance is given by

(A) $\sqrt{\frac{z}{y}}$ (B) $\sqrt{\frac{L}{C}}$

(C) $\sqrt{yz}$ (D) $\sqrt{LC}$

49. _____ circuit breakers are for low and medium voltages.

(A) A.C. air break (B) Air blast

(C) SF_6 (D) Vacuum

50. Flux linkages within a conductor producing flux in Wb-T/m are given by

(A) 0.5×10^{-7} (B) $\frac{\mu I}{8\pi}$

(C) $\frac{\mu}{4\pi}$ (D) $\frac{\mu I}{4\pi}$

51. With usual notation, the sag d is given by

(A) $d = H \cosh \frac{wl}{H}$ (B) $d = \frac{wl}{2T^2}$

(C) $d = \frac{H}{W}\left[\cosh\left(\frac{wl}{H}\right)+1\right]$ (D) $d = \frac{H}{W}\left[\cosh\left(\frac{wl}{H}\right)-1\right]$

52. Match List I with List II and select the correct answer using the codes given below the lists.

List I		List II
(a)	Thyrite arrester	1. Tower location
(b)	Sag template	2. Cross bonding
(c)	Cable sheaths	3. Restriking voltage
(d)	Circuit breaker	4. Non-linear resistor

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

53. The current chopping tendency is minimised by using the SF_6 gas at relatively

(A) high pressure and low velocity

(B) high pressure and high velocity

(C) low pressure and low velocity

(D) low pressure and high velocity

54. Protection scheme used for detection of loss of excitation of a very large generating unit feeding power into a grid employs

(A) under voltage relay

(B) offset mho relay

(C) under frequency relay

(D) percentage differential relay

55. The expression $AB + A\overline{B}$

(A) B

(B) A

(C) 1

(D) 0

56. The voltages at the two ends of a line are 132 kV and its reactance is 40 ohms. The capacity of the line is

(A) 435.6 MW

(B) 217.5 MW

(C) 251.5 MW

(D) 500 MW

57. Four identical alternators each rated for 20 MVA, 11 kV having a sub-transient reactance of 16% are working in parallel. The short circuit level of the bus-bars is

(A) 500 MVA

(B) 400 MVA

(C) 125 MVA

(D) 80 MVA

58. By placing an inverter between both inputs of an S-R flip flop, the resulting is a

(A) S-R latch (B) T-flip flop

(C) J-K flip flop (D) D- flip flop

59. Given : $X = 1010100$

$Y = 1000011$

Perform subtraction using 1's complement $X - Y = ?$

(A) 0001001 (B) 1001001

(C) 0010001 (D) 0010101

60. Simplify the following Boolean expression to a minimum number of literals.

$xy + x'z + yz$

(A) $xy + x'z$ (B) $xy + yz$

(C) $x'z + yz$ (D) $x'y + yz$

61. In a two stage amplifier, if the two stages has voltage gains as 20 dB and 40 dB, then the overall voltage gain in dB is

(A) 60 dB (B) 800 dB

(C) 20 dB (D) 10 dB

62. A transistor used as a switch is operated in

(A) active region (B) saturation region

(C) cut off region (D) cut off and saturation region

63. In a CE transistor β may be expressed in terms of α as

(A) $\beta = \frac{1-\alpha}{\alpha}$ (B) $\beta = \frac{1+\alpha}{\alpha}$

(C) $\beta = \frac{\alpha}{1+\alpha}$ (D) $\beta = \frac{\alpha}{1-\alpha}$

64. The frequency of oscillation of RC phase shift oscillator using OP-AMP is

(A) $f_0 = \frac{1}{2\pi RC}$

(B) $f_0 = \frac{1}{2\pi RC\sqrt{6}}$

(C) $f_0 = \frac{1}{4\pi RC}$

(D) $f_0 = \frac{1}{4\pi RC\sqrt{6}}$

65. The contents of a four bit register are initially 1011. The register is shifted 3 times to the right with the serial input being 101111. What are the contents of the register after the final shift?

(A) 1101

(B) 1111

(C) 1110

(D) 1011

66. An 8-input multiplexer is to be builts with a tree network of 2-input multiplexers. The number of 2-input multiplexers required are

(A) 2

(B) 4

(C) 8

(D) 16

67. A four bit counter has a maximum modulus of

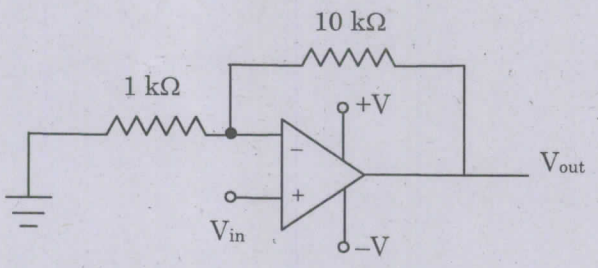
(A) 4

(B) 6

(C) 8

(D) 16

68. For the non inverting amplifier shown, find the output voltage for a input of one volt.



(A) 1 volt

(B) 10 volt

(C) 11 volt

(D) 0.1 volt

69. For a 6 pulse converter, the intervals between firing of six SCRs is

(A) 90° (B) 45°

(C) 30° (D) 60°

70. If V_{ph} is the rms value of line to neutral voltage applied to three phase full converter, then the maximum value of the output voltage is given by

(A) $3\sqrt{2}\, V_{ph} / \pi$ (B) $3\sqrt{3}\, V_{ph} / \pi$

(C) $3\sqrt{6}\, V_{ph} / \pi$ (D) $6\sqrt{3}\, V_{ph} / \pi$

71. Which of the following circuit cannot be operated directly from the mains?

(A) Bridge rectifier (B) Centre-tap rectifier

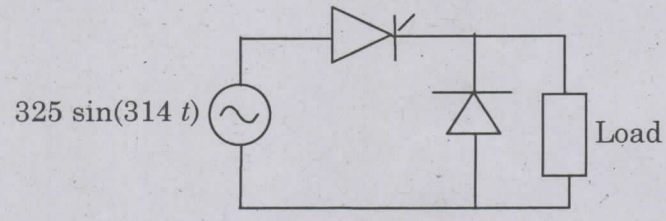
(C) Half wave rectifier (D) Voltage doubles

72. For a full wave single phase rectifier with freewheeling diode, the width of the freewheeling diode current pulse for each 2π cycle is

(A) $\pi + \alpha$ (B) $\pi - \alpha$

(C) π (D) 2α

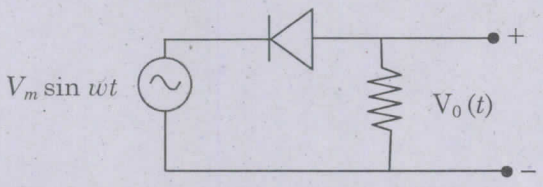
73. The figure shows the circuit diagram of a rectifier. The load consists of a 10 Ω resistance and an inductances 0.05 H connected in series. Assuming ideal thyristor and diode, the firing angle in degree to obtain an average load voltage of 70 V is



(A) 79.3° (B) 69.3°

(C) 90° (D) 108.3°

74. In the following circuit the average value of $V_0(t)$ will be



(A) 0

(B) $\frac{-V_m}{\pi}$

(C) $V_m/\sqrt{2}$

(D) $-V_m$

75. An electric motor developing a starting torque of 15 Nm starts with a load torque of 7 Nm on its shaft. If the acceleration at start is 2 rad/sec^2, the moment of inertia of the system must be

(A) 0.25 Kgm^2

(B) 0.25 Nm^2

(C) 4 Kgm^2

(D) 4 Nm^2

76. Match :

	List I (Circuit)	List II (Type of conversion)
(a)	Controlled Rectifier	1. Fixed DC to variable voltage, variable frequency AC
(b)	Chopper	2. Fixed DC to variable DC
(c)	Inverter	3. Fixed AC to variable DC
(d)	Cyclo converter	4. Fixed AC to variable frequency AC

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

77. The most suitable device for high frequency inversion in SMPS is

(A) BJT

(B) IGBT

(C) MOSFET

(D) GTO

78. If the clock frequency is 5 MHz, how much time is required to execute an instruction of 18 T-states?

(A) 3.6 micro seconds
(B) 3.6 milli seconds
(C) 0.36 milli seconds
(D) 0.036 micro seconds

79. The instruction IMUL DH in 8086 results in

(A) AL multiplied by DH and the unsigned product is in AX
(B) AL multiplied by DH and the signed product is in AX
(C) AL multiplied by DH and the unsigned product is in AL
(D) AL multiplied by DH and the unsigned product is in AH

80. Specify the memory location and its contents after the following instructions are executed in 8085

MVI B, F7 H

MOV A, B

STA XX75 H

HLT

(A) Location : 2075 H, Content : 7F H
(B) Location : 2075 H, Content : F 7H
(C) Location : 2075 H, Content : 00 H
(D) Location : 2075 H, Content : 07 H

81. In radix – 2 DIT, Fast Fourier Transform computation the number of additions and multiplications are given by

(A) $N(N-1)$ and N^2 respectively
(B) $N\log_2 N$ and $\frac{N}{2}\log_2 N$ respectively
(C) N^2 and $N\log_2 N$ respectively
(D) $\frac{N}{2}\log_2 N$ and $N(N-1)$ respectively

82. The filter that has a monotonic pass band and an equiripple stop band is

(A) Type II Chebyshev filter
(B) Type I Chebyshev filter
(C) Elliptic
(D) Butterworth

83. A high on TC line in 8257 indicates

(A) Byte transferred is 1
(B) Data transfer completion
(C) No data transferred
(D) Modulo 128 mark

84. The 8051 instruction JBC ACC.O, X makes the program to

(A) jump to location X if the LSB of accumulator is HIGH
(B) jump to location X if the LSB of accumulator is HIGH and also clears the LSB of accumulator
(C) jump to location X if the LSB of accumulator is LOW
(D) jump to location X if the LSB of accumulator is LOW and also sets the LSB of accumulator

85. Match List I with List II and select the answer :

	List I		List II
(a)	Detection of Periodic signal in noise	1.	Increase in Bandwidth
(b)	Recovery of band Limited single from its uniformly sampled values	2.	Slope overload error
(c)	Finer quantization of signals	3.	Nyquist rate
(d)	Delta modulation	4.	Cross correllation

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

86. Consider the following drawbacks :

1. Slope over load noise
2. Serration noise
3. Granular noise
4. Quantization noise

Which of these drawbacks does Delta modulation have?

(A) 1 and 2
(B) 1 and 4
(C) 1 and 3
(D) 2 and 4

87. When the sun is at an angle θ with the zenith, the air mass AM is given by?

(A) $\sin\theta$ (B) $\cos\theta$

(C) $1/\sin\theta$ (D) $1/\cos\theta$

88. The surface temperature of the sun is approximately

(A) 6000° K (B) 80,000° C

(C) 100,000° F (D) 10,00,000° K

89. The aperture area of a solar module is defined as

(A) the total area of the solar module

(B) the area of PV – active parts only

(C) the total area less the PV – active area

(D) the sum of the module area and the PV – active area

90. Instrument used to measure the total hemispherical solar radiation

(A) Pyrheliometer (B) Pyranometer

(C) Anemometer (D) Sunshine Recorder

91. Trickle charging of a storage battery helps to

(A) Maintain proper electrolyte level (B) Increase its reserve capacity

(C) Prevent sulphation (D) Keep it fresh and fully charged

92. The best indication about the state of charge on a lead acid battery is given by

(A) output voltage

(B) temperature of electrolyte

(C) specific gravity of electrolyte

(D) colour of the electrolyte

93. For a battery, A C-rate of 'n' indicates that the battery fully discharges in

(A) n hours (B) $C \times n$ hours

(C) C/n hours (D) $1/n$ hours

94. Find the voltage across AB in the circuit shown in fig. 1.

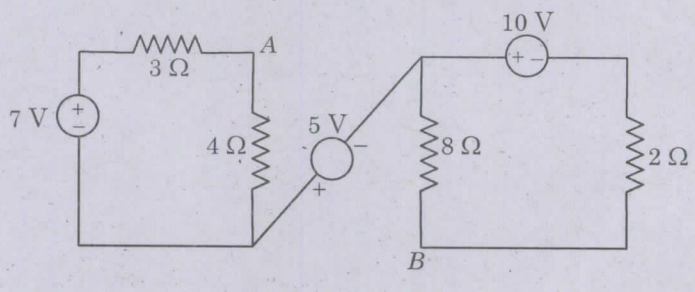
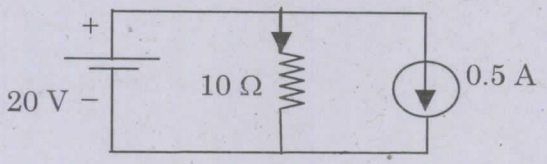


Fig. 1

(A) 7 V (B) 17 V (C) 1 V (D) 9 V

95. Current through the voltage source in the following circuit is



(A) 2 A (B) 2.5 A (C) 0.5 A (D) 25 A

96. A dc voltage V is applied at time $t = 0$ to a series RC circuit. The steady state current is

(A) $\frac{V}{R}$ (B) $\frac{V}{C}$ (C) Zero (D) $\frac{V}{\sqrt{R^2 + C^2}}$

97. A 100 watt electric bulb draws current I amp from 200 volt, 50 Hz supply. The current I is

(A) 1 A (B) $\sqrt{2}$ A (C) $\frac{1}{\sqrt{2}}$ A (D) 0.5 A

98. A series connected load draws a current $i(t) = 4\cos(100\pi t + 10)$ A with the source of $V(t) = 120\cos(100\pi t - 20)$ V. The apparent power and PF are

(A) 480 VA, 0.8 leading (B) 480 VA, 0.8 lagging
(C) 240 VA, 0.8 leading (D) 240 VA, 0.8 lagging

99. Superposition theorem is not applicable for

(A) Voltage calculations (B) Bilateral elements
(C) Power calculations (D) Passive elements

100. The code where all successive numbers differ from their preceding number by single bit is

(A) Binary code (B) BCD code

(C) Excess-3 code (D) Gray code

101. At resonant frequency, a RLC series circuit draws maximum current due to

(A) the difference between capacitive reactance and inductive reactance is zero

(B) the impedance is more than its resistance

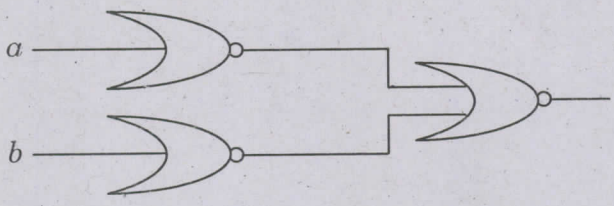
(C) the voltage across capacitor is equal to the applied voltage

(D) the PF is less than unity

102. Two coils X of 1000 turns and Y of 2000 turns are placed such that 60% of the flux produced by coil X links coil Y. A current 1 A in coil X produces 0.1 MWb flux. The mutual inductance between the coil is

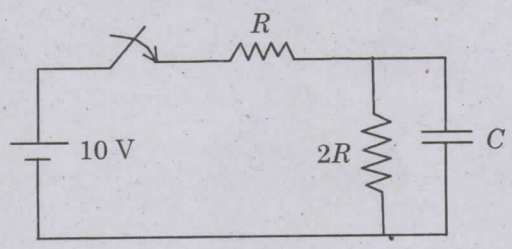
(A) 0.12 H (B) 0.08 H (C) 0.06 H (D) 0.04 H

103. The logic performance of the following circuit is



(A) NAND (B) AND (C) NOT (D) OR

104. The time constant of the network shown in figure is



(A) $2RC$ (B) $3RC$ (C) $RC/2$ (D) $2RC/3$

105. The relationship between electric field and electric potential is given by

(A) $\overline{E} = -\nabla^2 V$ (B) $\overline{E} = V$ (C) $\overline{E} = -\nabla V$ (D) $\overline{E} = -\frac{\nabla V}{2}$

106. The expression for lifting power of an electromagnet is

(A) $F = BH$ (B) $F = 2BH$ (C) $F = BH^2$ (D) $F = \frac{1}{2}BH$

107. Two long parallel conductors carry 100 A. If the conductors are separated by 20 mm, what is the force per metre of each conductor if the current flow is in opposite direction?

(A) 0.1 N/m (B) 0.2 N/m (C) 10 N/m (D) 20 N/m

108. Current flow in dielectric is

(A) conduction current
(B) current does not flow in dielectric
(C) displacement current
(D) free charge current

109. A circular coil of radius 2 m carries a current of 4 amperes. What is the value of magnetic field intensity at the centre?

(A) 2 A/m (B) 1 A/m (C) 10 A/m (D) 4 A/m

110. The following law relates the forces experienced by two loops of wires carrying current

(A) Coulomb's law
(B) Newton's law
(C) Ampere's law
(D) Gauss law

111. A uniform surface charge of $\sigma = 2$ c/m^2 is situated at $z = 2$ plane. What is the value of electric field at $P(1, 1, 1)$ m ?

(A) $1.1 \times 10^{+11}$ (B) 2.2×10^{-11} (C) 3.3 (D) 0

112. Magnitude of Lorentz force experienced by a charge Q moving with velocity v in magnetic flux density B is given by

(A) $F = Qv \times B$ (B) $F = B(Q \times v)$ (C) $F = B(v \times Q)$ (D) $B = F(v \times B)$

113. Electric flux inside a conducting sphere is

(A) uniform (B) zero (C) minimum (D) maximum

114. Which of the following amplifier has highest efficiency?

(A) Class-A (B) Class-B (C) Class-C (D) Class-AB

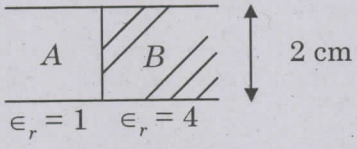
115. What is the capacitance of a capacitor having a stored energy of 10 microjoules with an applied voltage of 5 volts?

(A) $C = 0.4\ \mu F$ (B) $C = 0.8\ \mu F$ (C) $C = 0.12\ \mu F$ (D) $C = 1\ \mu F$

116. A point charge of $4\pi\varepsilon_0 C$ is situated at origin. What is the value of field intensity at (0, 0, 1) m?

(A) 1 V/m (B) 2 V/m (C) 4 V/m (D) 0 V/m

117. A parallel plate capacitor filled with two dielectrics is shown in the figure below. If the electric field in the region A is 4 kV/cm, the electric field in the region B in kV/cm is



(A) 1 (B) 2 (C) 4 (D) 16

118. Inductance is measured by

(A) Wien bridge (B) Schering bridge

(C) Maxwell's bridge (D) De Sauty's bridge

119. A basic D'Arsonval movement with a full scale deflection of 50 μA and internal resistance of 500 Ω is used as a volt meter. Determine the value of multiplier resistor to measure a voltage range of 0–10 V.

(A) 2.5 K Ohms (B) 199.5 kΩ

(C) 400 Ω (D) 200 Ω

120. When a galvanometer is connected in series with high resistance it becomes,

(A) an ammeter (B) a voltmeter

(C) a wattmeter (D) a multimeter

121. Match :

	List 1 (Terms)		List 2 (Meanings)
(a)	Precision	1.	The smallest change in the input quantity which can be detected
(b)	Accuracy	2.	Closeness of the reading to true value
(c)	Resolution	3.	Measure of reproducibility
(d)	Static sensitivity	4.	Ratio of infinitesimal change in output to infinitesimal change in input

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

122. Which one of the following materials is not used as a piezoelectric transducer?

(A) Rochelle salt
(B) Lithium sulphate
(C) Dipotassium tartrate
(D) Tungsten oxide

123. RTD (Resistance Temperature Detector) is an

(A) active transducer
(B) passive transducer
(C) inductive transducer
(D) capacitive transducer

124. Very small resistances can be measured more accurately by

(A) Resistance box
(B) Kelvin double bridge
(C) Anderson Bridge
(D) Schering bridge

125. A bridge circuit works at a frequency of 2 kHz. Which of the following can be used as a detector for null condition in the bridge?

(A) Headphones and vibration galvanometers
(B) Headphones and tunable amplifier
(C) Vibration galvanometer and tunable amplifier
(D) Headphones, vibration galvanometer and tunable amplifiers

126. A control system working under unknown random actions is called

(A) Computer control system
(B) Digital data system
(C) Stochastic control system
(D) Adaptive control system

127. _____ technique gives quick transient and stability response.

(A) Root locus
(B) Bode
(C) Nyquist
(D) Nichols

128. Phase margin of a system is used to specify

(A) frequency response
(B) absolute stability
(C) relative stability
(D) time response

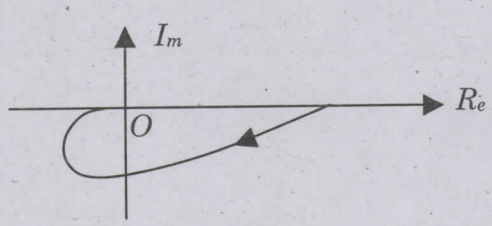
129. Pressure error can be measured by

(A) Differential bellows and strain gauge
(B) Selsyn
(C) Strain gauge
(D) Strain gauge and potentiometer

130. An amplidyne can give which of the following characteristics?

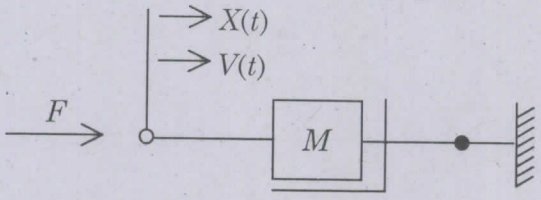
(A) constant current
(B) constant voltage
(C) constant current and constant voltage
(D) constant current, constant voltage and constant power

131. The polar plot of the system shown, the type of the system is



(A) 1
(B) 0
(C) 2
(D) None of the above

132. The mass element can be expressed as



(A) $F = \frac{Md^2x}{dt^2}$ (B) $F = f(v_1 - x_1)$

(C) $F = K\int_{-\alpha}^{t} u\,dt$ (D) $F = 0$

133. If a step function is applied to the input of a system and the output remains below a certain level for all the time, the system is

(A) not necessarily stable (B) stable

(C) unstable (D) always unstable

134. The type 2 system has _____ at the origin.

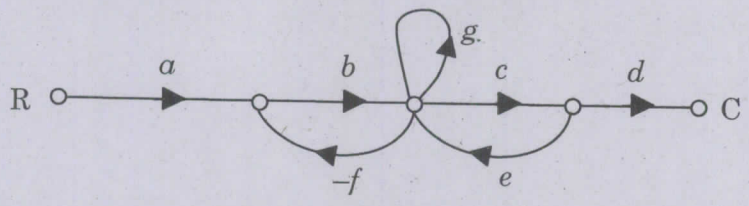
(A) no net pole (B) net pole

(C) simple pole (D) two poles

135. The unit impulse response of a second order under damped system starting from the rest is $c(t) = 12.5e^{-6t}\sin 8t$, the steady state value of $t \geq 0$ unit step response of the system is equal to

(A) 0 (B) 0.25 (C) 0.5 (D) 1

136. The signal flow graph shown in figure, the value of C/R is



(A) $\frac{abcd}{1+bf-ce-g}$ (B) $\frac{abcd}{1-bf+ce+g}$

(C) $\frac{abcd}{1-gf+ce+g}$ (D) $\frac{abcd}{1-(bf+ce+g)}$

137. The maximum speed at which the field of alternator can be operated to develop 60 Hz is

(A) 1800 rpm
(B) 3600 rpm
(C) 7200 rpm
(D) 1500 rpm

138. Match List I (Machines) with List II (Test) and select the correct answer.

List I		List II
(a)	Transformer	1. Slip test
(b)	DC motor	2. Blocked rotor test
(c)	Alternator	3. Sumpner's test
(d)	Induction Motor	4. Swinburne's test

Codes :

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

139. When the excitation of normally operating unloaded salient pole synchronous motor suddenly gets disconnected, it continuous to run as

(A) Schrage motor
(B) Spherical motor
(C) Switched reluctance motor
(D) Variable reluctance motor

140. In a split phase motor, the running winding should have

(A) High resistance and low inductance
(B) High resistance and high inductance
(C) Low resistance and high inductance
(D) Low resistance and low inductance

141. If rotor input of a squirrel cage induction motor running with a slip of 10% is 100 kW, gross power developed by its rotor is ———— kW.

(A) 10
(B) 90
(C) 99
(D) 80

142. A single phase transformer when supplied from 220 V, 50 Hz has eddy current loss of 50 W. If the transformer is connected to a voltage of 330 V, 50 Hz, the eddy current loss will be

(A) 168.75 W
(B) 112.5 W
(C) 75 W
(D) 50 W

143. The device which converts alternating current into direct current in a dc machine is

(A) poles
(B) brushes
(C) armature winding
(D) commutator

144. The current drawn by 220 V DC motor of armature resistance of 0.5 Ω and back emf of 200 V is

(A) 40 A
(B) 44 A
(C) 440 A
(D) 400 A

145. A DC series motor is accidentally connected to single phase AC supply. The torque produced will be

(A) of zero average value
(B) oscillating
(C) steady and unidirectional
(D) pulsating and unidirectional

146. A dynamo has a rated armature current at 250 A. What is the current per path of the armature if the armature winding is simplex wave wound? The machine has 12 poles

(A) 250 A
(B) 125 A
(C) 20.833 A
(D) 10.4 A

147. A power system consists of 300 buses out of which 20 buses are generator buses, 25 buses are the ones with reactive power support and 15 buses are the ones with fixed shunt capacitors. All the other buses are load buses. It is proposed to perform a load flow analysis using NR method. The size of NR Jacobian matrices

(A) 553 × 553
(B) 540 × 540
(C) 555 × 555
(D) 554 × 554

148. A system is reactance grounded, if

(A) $\frac{x_0}{x_1} > 3$ but less than that for resonant grounding

(B) $\frac{x_0}{x_1} > 3$

(C) $\frac{R_0}{x_1} > 3$

(D) $\frac{x_0}{x_1} > 3$ and $\frac{R_0}{x_1} > 3$

149. The order of the lightning discharge current is

(A) 10,000 amp (B) 100 amp

(C) 1 amp (D) 1 micro-amp

150. A hydro-electric generating station is supplied from a reserviour of capacity 5×10^6 cubic metres at a head of 200 metres. The total energy available in kWh if the overall efficiency is 75% is

(A) 2.044×10^6 kWh (B) 252×10^6 kWh

(C) 775 kWh (D) 81620 kWh

151. The positive sequence component of voltage at the point of fault is zero when it is a

(A) 3-phase fault (B) L-L fault

(C) L-L-G fault (D) L-G fault

152. The purpose of lead sheath in cables is

(A) to protect from mechanical wear and tear

(B) to protect from moisture

(C) to give a round shape

(D) to provide a steel armour around it

153. Earth wire on EHV overhead transmission line is provided to protect the line against

(A) lightning surge (B) switching surge

(C) excessive fault voltages (D) corona effect

154. The number of flip flops required to construct a decade counter is

(A) 10 (B) 8

(C) 4 (D) 3

155. Which one of the following is not correct?

(A) $P_i - jQ_i = V_i^* \sum_{j=1}^{n} Y_{ij} V_j$

(B) $V_i = |V_i|(\cos\delta_i + j\sin\delta_i)$

(C) Real power loss = $\sum_{i=1}^{n} P_i = \sum_{i=1}^{n} P_{gi} - \sum_{i=1}^{n} P_{di}$ (Total generation) – (Total load)

(D) $Q_i = \sum_{j=1}^{n} |Y_{ij} V_i V_j| \cos(\delta_i - \delta_j - \theta_{ij})$

156. A 132 kV transmission line has the weight of conductor = 680 kg/km; length of span = 260 m; ultimate strength = 3100 kg; safety factor = 2; and ground clearance = 10 m. The height above ground at which the conductor be supported is

(A) 10 m

(B) 3.7 m

(C) 260 m

(D) 13.7 m

157. The flip-flops belongs to a category of a logic circuits known as

(A) Monostable multivibrator

(B) Astable multivibrator

(C) Bistable multivibrator

(D) One shot

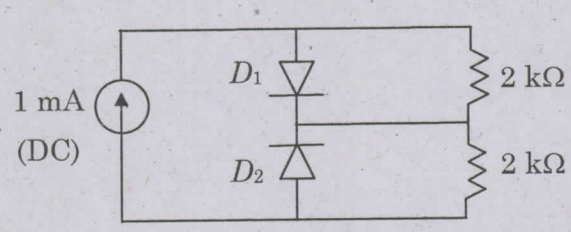
158. In a common emitter configuration, calculate emitter current I_E in a transistor for which $\beta = 50$ and base current $I_B = 20\ \mu A$

(A) 0.102 mA
(B) 1.02 mA
(C) 10.2 mA
(D) 102 mA

159. Avalanche breakdown results due to

(A) process of rise in temperature
(B) disrupting bonds
(C) strong electric field across the junction
(D) valance electrons

160. Assume the D_1 and D_2 in the figure are ideal diodes. The value of current I through D_2 is



(A) 0 mA
(B) 0.5 mA
(C) 1 mA
(D) 2 mA

161. If the ac input to a half wave rectifier has an r.m.s value of $400/\sqrt{2}$ volts, then diode PIV rating is

(A) $400/\sqrt{2}$ V
(B) $400 \times \sqrt{2}$ V
(C) 400 V
(D) 202.84 V

162. The most desirable feature of a transformer coupling is

(A) higher voltage gain
(B) wide frequency range
(C) ability to provide impedance matching between the stages
(D) ability to eliminate hum from the output

163. How many 32 K × 8 RAM chips are needed to provide a memory capacity of 512 K bytes?

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

164. For a full wave rectifier, match the following :

	Column A		Column B
(a)	I_{dc}	1.	0.482
(b)	Ripple factor	2.	$2I_m / \pi$
(c)	Efficiency	3.	$I_m / \sqrt{2}$
(d)	I_{rms}	4.	0.812

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

165. The a.c drain resistance of a JFET is calculated using

(A) $\frac{\Delta V_{DS}}{\Delta I_D}$ at constant V_{GS}

(B) $\frac{\Delta I_D}{\Delta V_{GS}}$ at constant V_{DS}

(C) $\frac{\Delta V_{GS}}{\Delta I_D}$ at constant V_{DS}

(D) $\frac{\Delta I_D}{\Delta V_{DS}}$ at constant V_{GS}

166. The effect of source inductance on the performance of single phase and three phase full converter is to

(A) reduce the ripples in the load current
(B) make the discontinuous current as continuous
(C) reduces the output voltage
(D) increases the load voltage

167. Resonant pulse inverters are used for

(A) Generating large peak voltage

(B) Overcoming the switching losses

(C) Eliminating the harmonics

(D) Converting a square wave into sine wave

168. A single phase half bridge inverter is feeding a load of 2.9 Ω from 48 V DC source. The RMS output voltage at fundamental frequency is

(A) $2 \times 48/\pi$

(B) $2 \times 48/\sqrt{2}\pi$

(C) $(\sqrt{2} \times 48)/\pi$

(D) $(2 \times 48)/2\sqrt{2}\pi$

169. The output voltage waveform of a three phase square-wave inverter contains

(A) only even harmonics

(B) both odd and even harmonics

(C) only odd harmonics

(D) only triple harmonics

170. The number of junctions in a silicon controlled rectifier is

(A) two

(B) three

(C) four

(D) six

171. Which one of the following is not a current triggered device?

(A) SCR

(B) GTO

(C) TRIAC

(D) MOSFET

172. Number of thyristors, each with the rating of 500 V, 75 A required in each branch of a series – parallel combination for a circuit with the total voltage and current rating of 7.5 KV and 1 KA respectively. If the device derating factor is 14%, then what is the number of thyristors in series and parallel branch respectively?

	No.of thyristors in series branch	No.of thyristors in parallel branch
(A)	18	16
(B)	15	14
(C)	12	12
(D)	16	18

173. A DC motor with the supply from single phase half controlled rectifier can be operated in

(A) Forward motoring

(B) Reverse motoring and reverse braking mode

(C) Forward motoring and forward braking mode

(D) Reverse motoring and forward braking mode

174. In a single phase cyclo converter, an inter group reactor is used to

(A) Reduce the current ripples

(B) Reduce the voltage ripples

(C) Limit the circulating current

(D) Limit di/dt

175. The output voltage of a DC chopper consists of rectangular pulse of duration 1 msec in overall cycle time of 3 msec. If DC chopper is fed by 100 V DC, then the average value of output voltage and ripple factor are respectively

(A) 33.33, 1.41

(B) 66.66, 1.41

(C) 33.33, 1

(D) 66.66, 1

176. A boost regulator has an input voltage of 5V and the average output voltage of 15 V. The duty cycle is

(A) 3/2

(B) 2/3

(C) 5/2

(D) 15/2

177. The result of the instruction NEGCH in 8086 results in

(A) CH one's complemented

(B) CH two's complemented

(C) CH nine's complemented

(D) CH ten's complemented

178. The instruction RST 7 is a

(A) Restart instruction that begins the execution of a program

(B) One-byte call to the memory address 0038 H

(C) One-byte call to the memory address 0007 H

(D) Hardware interrupt

179. Calculate the Full-scale output for an 8-bit DAC for the (0 to 10) Volt range

(A) 9.691 Volt
(B) 9.961 Volt
(C) 9.5 Volt
(D) 10 Volt

180. The average power of the energy signal is

(A) Finite
(B) Zero
(C) Infinite
(D) Between 2 and 4

181. $\sin c(x)$ function is defined as

(A) $\sin c(x) = \frac{\pi x}{\sin(\pi x)}$
(B) $\sin c(x) = \frac{\sin(\pi x)}{\pi x}$
(C) $\sin c(x) = \frac{\sin \pi x}{\pi}$
(D) $\sin c(x) = \frac{\pi}{\sin(\pi x)}$

182. The analog signal, $m(t) = 4\cos 100\pi t + 8\sin 200\pi t + \cos 300\pi t$, the Nyquist sampling rate will be

(A) $\frac{1}{100}$ sec
(B) $\frac{1}{200}$ sec
(C) $\frac{1}{300}$ sec
(D) $\frac{1}{600}$ sec

183. The ISR status of 8259 after IR4 is accepted is

(A) 7, 6, 5, 4, 3, 2, 1, 0
(B) 0, 7, 6, 5, 4, 3, 2, 1
(C) 2, 1, 0, 7, 6, 5, 4, 3
(D) 3, 2, 1, 0, 7, 6, 5, 4

184. For latching the content of a counter of 8253 while the count is still going on

(A) The bits D7 and D6 of the control word are to be made 0
(B) The bits D5 and D4 of the control word are to be made 0
(C) The bits D3 and D2 of the control word are to be made 0
(D) The bits D1 and D0 of the control word are to be made 0

185. No. of modes of operation in 8255A PPI is

(A) 1 (B) 2 (C) 3 (D) 4

186. Five cells, each with an emf of 2 V and Internal resistance of 0.5 Ω are connected in series the resulting battery will have

(A) $E = 2V$; $R_{in} = 0.5\Omega$ (B) $E = 10V$; $R_{in} = 2.5\Omega$

(C) $E = 2V$; $R_{in} = 0.1\Omega$ (D) $E = 10V$; $R_{in} = 0.1\Omega$

187. In a fuel cell the negative electrode is of

(A) Carbon monoxide (B) Hydrogen

(C) Oxygen (D) Ammonia

188. The process that converts solid coal in to liquid Hydro carbon fuel is called

(A) Liquefaction (B) Carbonation

(C) Catalytic conversion (D) Hydrolysis

189. The theoretical conversion efficiency of hydrogen – oxygen fuel cell at 25° C is

(A) 56% (B) 17% (C) 75% (D) 83%

190. Super capacitor is a

(A) Generator (B) Battery alone

(C) Hybrid of capacitor and a battery (D) Motor

191. The tip speed ratio of the wind turbine is defined as

(A) $\lambda = \omega_r R$ (B) $\lambda = (\omega_r R)/V$

(C) $\lambda = V/(\omega_r R)$ (D) $\lambda = \dfrac{V}{\omega_r}$

192. How many blades does a modern wind turbine have?

(A) 2 (B) 3 (C) 4 (D) 1

193. The wind intensity can be described by

(A) Reynolds number (B) Mach number

(C) Beaufort number (D) Froude number

194. In a PCM system a 5 bit encoder is used. Suppose each represents 1 Volt, what is the range of encoder?

(A) 0 – 32 V
(B) 0 – 31 V
(C) 1 – 31 V
(D) 1 – 32 V

195. When a subroutine is called, the address of the instructions following the CALL instruction is stored in / on the

(A) Stack Pointer
(B) Accumulator
(C) Program Counter
(D) Stack

196. In PV systems, 1 equivalent sun indicates a solar irradiance of

(A) 1000 W/m^2
(B) 100 W/m^2
(C) 10 W/m^2
(D) 1 W/m^2

197. The relation between the incident angle θ_i and the refracted angle θ_t of a light beam falling at the junction of two media having relative refractive indices of n_1 and n_2 is given by

(A) $n_1 \sin\theta_t = n_2 \sin\theta_i$
(B) $n_1 \sin\theta_i = n_2 \sin\theta_t$
(C) $n_1 \sin\theta_i = n_2 \cos\theta_t$
(D) $n_1 \cos\theta_i = n_2 \sin\theta_t$

198. The voltage factor for a typical silicon cell is

(A) 0.4
(B) 0.5
(C) 0.6
(D) 0.7

199. The hour angle of solar radiation is

(A) 5° / hour
(B) 10° / hour
(C) 15° / hour
(D) 20° / hour

200. The fill factor FF of a solar cell is defined as

(A) $V_{OC} \cdot I_{SC}$
(B) $V_{OC} \cdot I_{SC} / P_{min}$
(C) $P_{max} / V_{OC} \cdot I_{SC}$
(D) P_{max} / P_{min}

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