ELECTRICAL ENGINEERING

Time Allowed: **Three Hours** Maximum Marks: **300**

INSTRUCTIONS

1. *IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.*
2. ***Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.***
3. *You have to enter your Roll Number on the Test. Booklet in the Box provided alongside.* ***DO NOT write anything else*** *on the Test Booklet.*
4. *This Test Booklet contains* ***150*** *items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case, you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose* ***ONLY ONE*** *response for each item.*
5. *You have to mark all your response* ***ONLY*** *on the separate Answer Sheet provided. See directions in the Answer Sheet.*
6. *All items carry equal marks.*
7. *Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particular in the Answer Sheet as per instructions sent to you with your Admission Certificate.*
8. *After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator only the Answer Sheet. You are permitted to take away with you the Test Booklet.*
9. *Sheets for rough work are appointed in the Test Booklet at the end.*
10. ***Penalty for wrong answer:***

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.

    - ***(i)*** *There are alternate for the answer to every question. For each question for which a wrong answer has been given by the candidate, one-third (0.33) of the marks assigned to that question will be deducted as penalty.*
    - ***(ii)*** *If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to the correct and there will be same penalty as above to that question.*
    - ***(iii)*** *If a question is left blank, i.e., no answer is given by the candidate, there will be no penalty for that question.*

1. What is the value of $\int_0^{2+i}(\bar{z})^2\,dz$, along the line $y=\frac{x}{2}$?

(A) $\frac{5}{3}(2-i)$

(B) $\frac{1}{3}(2-i)$

(C) $\frac{4}{3}(2+i)$

(D) $2-i$

Answer: (A)

2. The following is the frequency distribution of a random sample of weekly earnings of 509 employees:

Weekly earning	No. of employees
10	3
12	6
14	10
16	15
18	24
20	42
22	75
24	90
26	79
28	55
30	36
32	26
34	19
36	13
38	9
40	7

What is the average weekly earning?

(A) 26.16

(B) 24.87

(C) 28.61

(D) 20.74

Answer: (B)

3. The numbers examined, the mean weight and the standard deviation in each group of examination by three medical examiners are given below. What is the standard deviation of the entire data when grouped together?

Med. exam.	Nos.examined	Mean wt. (lb)	SD (lb)
A	50	113	6
B	60	120	7
C	90	115	8

(A) 8.183 lb

(B) 7.746 lb

(C) 7.152 lb

(D) 6.981 lb

Answer: (B)

4. The solution for

$$\frac{d^4x}{dt^4}+4x=0$$

is

(A) $x=e^{-t}(c_1\cos 2t+c_2\sin 2t)+e^{t}(c_3\cos 2t+c_4\sin 2t)$

(B) $x=e^{-t}(c_1\cos 4t+c_2\sin 4t)+e^{t}(c_3\cos 4t+c_4\sin 4t)$

(C) $x = e^{-t}\left(c_1 \cos + c_2 \sin t\right) + e^{t}\left(c_3 \cos t + c_4 \sin t\right)$

(D) $x = e^{-2t}\left(c_1 \cos t + c_2 \sin t\right) + e^{4t}\left(c_3 \cos t + c_4 \sin t\right)$

Answer: (C)

5. What is the deflection u(x, y, t) of the square membrane with a = b and c = 1, if the initial velocity is zero and the initial deflection is f(x, y) = $A\sin \pi x \sin 2\pi y$?

(A) $A\sin \pi x \sin 2\pi y$

(B) $A\sin \pi x \sin 2\pi y \sin\left(\sqrt{3}\pi t\right)$

(C) $A\sin \pi x \sin 2\pi y \tan\left(\sqrt{6}\pi t\right)$

(D) $A\sin \pi x \sin 2\pi y \cos\left(\sqrt{5}\pi t\right)$

Answer: (D)

6. If $u = x\log xy$, where $x^3 + y^3 + 3xy = 1$, what is du/dx?

(A) $\frac{du}{dx} = \log xy - \frac{x\left(x^2 + y\right)}{y\left(y^2 + x\right)}$

(B) $\frac{du}{dx} = 0.5 + \log xy - \frac{x\left(x^2 + 2y\right)}{y\left(y^2 + x\right)}$

(C) $\frac{du}{dx} = 2 + \log xy - \frac{x\left(x^2 + y\right)}{y\left(y^2 + 2x\right)}$

(D) $\frac{du}{dx} = 1 + \log xy - \frac{x\left(x^2 + y\right)}{y\left(y^2 + x\right)}$

Answer: (D)

7. What is the particular integral of $\left(D^3 + 1\right)y = \cos\left(2x - 1\right)$?

(A) $\frac{1}{25}\left[\cos\left(2x-1\right) - 5\sin\left(2x-1\right)\right]$

(B) $\frac{1}{55}\left[\cos\left(2x-1\right) - 6\cos\left(2x-1\right)\right]$

(C) $\frac{1}{65}\left[\cos\left(2x-1\right) - 8\sin\left(2x-1\right)\right]$

(D) $\frac{1}{75}\left[\sin\left(2x-1\right) - 4\sin\left(2x-1\right)\right]$

Answer: (C)

8. Let X be a Poisson variable such that $P[X=2] = 9P[X=4] + 90P[X=6]$

Then $E[X]$ is equal to

(A) 1

(B) e^2

(C) $\log 2$

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

Answer: (A)

9. A random variable X takes values 0, 1, 2, 3, … with probability proportional to $(x+1)\left(\frac{1}{5}\right)^x$.

Then $P[X \le 2]$ is

(A) $\frac{1}{225}$

(B) $\frac{503}{911}$

(C) $\frac{608}{625}$

(D) $\frac{11}{25}$

Answer: (C)

10. A die is thrown as long as necessaryfor a 6toturn up.Given that6doesnot turn up at the first throw. Whatistheprobability thatmore than fourthrows are necessary?

(A) $\frac{125}{216}$

(B) $\frac{121}{323}$

(C) $\frac{271}{341}$

(D) $\frac{9}{19}$

Answer: (A)

11. If A and B are independent events and $P(A)=P(B)(A)=\frac{1}{2}$, then $P[A\cup B]$ is

(A) $\frac{2}{5}$

(B) $\frac{3}{7}$

(C) $\frac{5}{9}$

(D) $\frac{3}{4}$

Answer: (D)

12. The solution of the initial value problem

$$\frac{d^2y}{dx^2}+\frac{dy}{dx}-6y=0;\ y(0)=6,\ y'(0)=2$$

is

(A) $2e^{x}+3e^{7x}$

(B) $e^{x}-e^{7x}$

(C) $4e^{2x}+2e^{-3x}$

(D) $e^{x}(\sin x+\cos x)$

Answer: (C)

13. How is J-K flip flop created from S-R latch?

(A) By adding more inputs

(B) By replacing the S and R inputs with NAND gates

(C) By connecting the inputs to the outputs

(D) By changing the clock input

Answer: (B)

14. How many select input lines are there in 1-to-8 demultiplexer?

(A) 2

(B) 1

(C) 4

(D) 3

Answer: (D)

15. How many comparators and resistors are used in n-bit flash A-to-D converter respectively?

(A) 2^{n} and $2^{n}-1$

(B) 2^{n} and $2^{n}+1$

(C) $2^n + 1$ and 2^n

(D) $2^n - 1$ and 2^n

Answer: (D)

16. What is the percentage resolution of a 4-bit R-2R ladder DAC, which has a reference voltage of 4.5V?

(A) 6.25%

(B) 6.67%

(C) 7.25%

(D) 7.67%

Answer: (B)

17. Consider the following statements regarding successive approximation ADC:

1. The output data can be taken out of the converter either in series or in parallel.

2. The circuit is less complex compared to ramp ADC.

3. As the conversion time is not dependent on the analog input, so it is comparatively faster.

Which of the above statements is/are correct?

(A) 1and2

(B) 2only

(C) 3only

(D) 1and3

Answer: (C)

18. What are the key properties of an op-amp which plays an important role in designing op-amp operated active filters?

(A) High output impedance, low input impedance and the possibility of having signal amplification to the desired level

(B) High input impedance, low output impedance and the possibility of having signal amplification to the desired level

(C) High output impedance, low input impedance and the possibility of having signal amplification to the higher level only

(D) High input impedance, low output impedance and the possibility of having signal amplification to the lower level only

Answer: (B)

19. Which one of the following stores all data written toand read frommemory?

(A) Instruction register

(B) Memorybuffer register

(C) Memoryaddress register

(D) Status register

Answer: (B)

20. What does 'STA address' stand for in 8085 microprocessor?

(A) Copy the data byte at the memory location specified by the 16-bit address into the accumulator

(B) Copy the data from the source to the destination location specified by the 16-bit address

(C) Copy the data from the destination to the source location specified by the 16-bit address

(D) Copy the data from the accumulator to the memory location specified by the 16-bit address

Answer: (D)

21. An AM commercial broadcast receiver is operating in a frequency band of 535 kHz to 1605 kHz with an input filter factor of 54. What are the bandwidths at the low and high ends of RF spectrum respectively?

(A) 100 kHz and 29.63 kHz

(B) 10 kHz and 2.96 kHz

(C) 10 kHz and 29.63 kHz

(D) 100 kHz and 2.96 kHz

Answer: (C)

22. Consider the following statements regarding digital communication:

1. Digital signals can be coded to yield extremely low error rates and low fidelity.

2. Digital signals are easier to encrypt for security and privacy.

3. Digital signal storage is expensive.

Which of the above statements is/are correct?

(A) 1 and 2

(B) 2 only

(C) 3 only

(D) 1 and 3

Answer: (A)

23. Consider the following statements regarding Time-Division Multiplexing (TDM):

1. TDM is readily implemented with high-density VLSI circuitry.

2. TDM synchronization is less demanding than that of suppressed-carrier FDM.

3. TDM crosstalk immunity does not depend on the transmission band-width.

Which of the above statements is/are correct?

(A) 1 and 2

(B) 2 only

(C) 1only

(D) 1 and 3

Answer: (C)

24. What is net base band bandwidth in Frequency-Division Multiplexing?

(A) It is the sum of the modulated message bandwidths and the guard bands

(B) Itisthe product ofthemodulated message bandwidths and the guard bands

(C) It is the value obtained by subtracting modulated message bandwidths from the guard bands

(D) It is the product of the modulating message bandwidths and the modulated message

Answer: (A)

25. During serial transmission, a group of 512 sequential 12-bit data words is transmitted in 0.016 s. What is the speed of transmission?

(A) 384 kbps
(B) 384 bps
(C) 6.84 kbps
(D) 6.84 bps

Answer: (A)

26. What is the property of anisotropic material that must besatisfied?

(A) It has the same electric properties for the various directions of appliance of the electric field
(B) Ithasthedifferentelectric properties forthe various directionsofappliance ofthe electric field
(C) It has the different electric properties for the same direction of appliance of the electric field
(D) It has the same electric properties for the opposite directions of appliance of the electric field

Answer: (A)

27. What is the order of resistivity of conductive material?

(A) $10^{-6}\Omega$-m to 10^{-8} Ω-m
(B) $10^{6}\Omega$-m to 10^{8} Ω-m
(C) $10^{-10}\Omega$-m to 10^{8} Ω-m
(D) $10^{-9}\Omega$-m to 10^{12} Ω-m

Answer: (A)

28. What are the properties of good insulating material?

(A) Low dielectric strength, volume resistivity of high value and very low dissipation factor
(B) Low dielectric strength, volume resistivity of low value and very low dissipation factor
(C) Low dielectric strength, volume resistivity of low value and high dissipation factor
(D) High dielectric strength, volume resistivity of high value and very low dissipation factor

Answer: (D)

29. What is the value of the Curie temperature of iron?

(A) About1043K
(B) About1555K
(C) About1422K
(D) About1322K

Answer: (A)

30. Which one of the following is the correct relationship among the Curie temperatures of Fe, Ni and Co?

(A) (D / d) (Ni) Curie < (D / d) (Fe) Curie < (D / d) (Co) Curie
(B) (D / d) (Ni) Curie < (D / d) (Co) Curie < (D / d) (Fe) Curie
(C) (D / d) (Co) Curie < (D / d) (Ni) Curie < (D / d) (Fe) Curie
(D) (D / d) (Fe) Curie< (D / d) (Ni) Curie < (D / d) (Co) Curie

Answer: (*)

31. What are the important characteristics that must be satisfied for the materials used to build permanent magnets?

(A) Low permeability, high coercive force and high Curietemperature

(B) Low permeability, high coercive force and low Curie temperature

(C) High permeability, high coercive force and high Curietemperature

(D) High permeability, low coercive force and low Curie temperature

Answer: (A)

32. What are the important characteristics that must be satisfied for the materials used to build core of the transformer?

(A) High permeability, low hysteresis and high eddy current losses

(B) High permeability, low hysteresis and eddy current losses

(C) High permeability, high hysteresis and eddy current losses

(D) Low permeability, low coercive force and lowCurie temperature

Answer: (B)

33. What are the nominal values of drop in potential across conducting silicon diodes, Schottky diodes and light-emitting diodes respectively?

(A) 0.6 to0.7 volt,0.2 V and1 .4 V

(B) 0.6to0.7 volt,1 .2 Vand 0.2 V

(C) 0.6to0.7 volt,2.2 Vandl .4 V

(D) 0.6 to0.7 volt,0.2 Vand 5.4 V

Answer: (A)

34. Which one of the following statements is correct related to extrinsic and degenerate semiconductors?

(A) Lightly and moderately doped semiconductor is referred to as extrinsic and when it is doped to such high levels that it acts more like a conductor than a semiconductor, it is referred to as degenerate.

(B) Heavily doped semiconductor is referred to as extrinsic and when it is doped to such high levels that it acts more like a conductor than a semiconductor, itis referred to as degenerate.

(C) Moderately doped semiconductor is referred to as extrinsic and when it is doped to such low levels that it acts more like a conductor than a semiconductor, it is referred to as degenerate.

(D) Lightly doped semiconductor is referred to as extrinsic and when it is doped to such low levels that it acts more like a conductor than a semiconductor, it is referred to as degenerate.

Answer: (A)

35. What is an optoisolator?

(A) LED is paired with a photodiode or photo transistor in the same package and it allows DC coupling

(B) LED is paired with a silicon diode in the same package and it allows AC coupling

(C) LED is paired with a photodiode or photo transistor in the same package and it does not allow DC coupling

(D) LED is paired with a photodiode or phototransistor in the same package and it does not allow AC coupling

Answer: (A)

36. Which one of the following is correct related to Type-1 superconductors along with the critical transition temperature (T_c) ?

(A) Lead(Pb) of 4. 15K,Mercury(Hg) of 7.196K and Aluminium (Al) of1.175 K

(B) Lead(Pb) of 7.196 K, Mercury (Hg)of 4.15K and Aluminium (Al)of1.175 K

(C) Lead(Pb) of 1.175K, Mercury (Hg)of 4.15K and Aluminium (Al)of7.196 K

(D) Lead(Pb) of 7.196 K, Mercury (Hg)of 1.175K and Aluminium (Al) of4.15 K

Answer: (B)

37. Organic superconductors are composed of

(A) both an electron donor(the planar organic molecule) and an electron acceptor (a non-organic anion)

(B) an electron donor (the planar organic molecule)only

(C) an electron acceptor (a non-organic anion)only

(D) both an electron donor(anon- organic anion) and an electron acceptor (the planar organic molecule)

Answer: (D)

38. If the input signal is $x(n)=\sin c\left(\frac{\omega_c n}{\pi}\right)$, then what is the energy of the signal (Assume $\omega_c<\pi$)

(A) $\frac{\omega_c}{\pi}$

(B) $\frac{\pi}{\omega_c}$

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

(D) $\frac{2\pi}{\omega_c}$

Answer: (B)

39. Let $X\left(e^{j\omega}\right)$ be the Fourier transform of the signal $x(n)=\left\{-1,0,1,\underset{\uparrow}{2},1,1,0,1,2,1,0,-1\right\}$, where $-3\le n\le 7$. What is the value of the following?

$$\int_{-\pi}^{\pi}\left|\frac{dX\left(e^{j\omega}\right)}{d\omega}\right|^2 d\omega$$

(A) 28π

(B) 256π

(C) 316π

(D) 356π

Answer: (C)

40. What is the inverse Fourier transform of the following?

$$X\left(e^{j\omega}\right)=\begin{cases}2j, & 0<\omega\le\pi\\ -2j, & -\pi<\omega\le 0\end{cases}$$

(A) $1+\cos\left(\frac{\pi}{2}n\right)$

(B) $\frac{2}{n\pi}\sin\left(\frac{n\pi}{2}\right)$

(C) $\frac{4}{n\pi}\sin\left(\frac{n\pi}{4}\right)$

(D) $\frac{4}{n\pi}\sin^2\left(\frac{n\pi}{2}\right)$

Answer: (D)

41. If $x(n)=\delta(n-1)+\delta(n+1)$, what is the DTFT value for the given signal?

(A) $\sin(\omega)$

(B) $\cos(\omega)$

(C) $2\sin(\omega)$

(D) $2\cos(\omega)$

Answer: (D)

42. If $x(n)=\cos(\omega_0 n)u(n)$, then what is the DTFT of the signal?

(A) $\pi\left[\delta(\omega-\omega_0)+\delta(\omega+\omega_0)\right]$

(B) $\pi\left[\delta(\omega-\omega_0)-\delta(\omega+\omega_0)\right]$

(C) $\pi+\pi^2\left[\delta(\omega-\omega_0)+\delta(\omega+\omega_0)\right]$

(D) $\pi^2+\pi\left[\delta(\omega-\omega_0)+\delta(\omega+\omega_0)\right]$

Answer: (*)

43. What are the initial and final values of y(t) respectively, if its Laplace transform is $Y(s)=\frac{10(2s+3)}{s(s^2+2s+5)}$?

(A) 4 and 1

(B) 1 and 6

(C) 3 and 5

(D) 0 and 6

Answer: (D)

44. If the function $x(t)=10\sin c\left(\frac{t+4}{7}\right)$, then what is the total area under the function?

(A) 28

(B) 40

(C) 70

(D) $\frac{40}{7}$

Answer: (C)

45. If $x(t)=\delta(3t)+u(3t)$, then what are the Laplace transform and the associated ROC for the function of time respectively?

(A) $\frac{1}{3}\left(\frac{s^2+1}{s}\right), R(s)>3$

(B) $\frac{1}{3}s+\frac{3}{s}, R(s)<3$

(C) $\frac{s^2+3}{3s}, R(s)<0$

(D) $\frac{s+3}{3s}, R(s)>0$

Answer: (D)

46. Consider a random variable X with a uniform p.d.f on $\left[-\frac{1}{2},\frac{1}{2}\right]$. Assume that the random variable $Y = X^2$, i.e., $g(r) = r^2$. What is the value of E(Y)?

(A) $\frac{1}{4}$

(B) $\frac{1}{12}$

(C) $\frac{1}{16}$

(D) $\frac{1}{256}$

Answer: (B)

47. What is the relationship between H(1) and H(2) from the N-point DFT of $h(n) = e^{-\frac{n}{5}}$, $0 \le n \le N$? (Take N = 3)

(A) $H(1) = H(2)$

(B) $H(1) = H^*(2)$

(C) $H(2) = 2H(1)$

(D) $H(2) + H(1) = 0$

Answer: (B)

48. What is the autocorrelation of the energy signal $x(t) = e^{-t}u(t)$?

(A) $\frac{1}{2}$ for $-\infty < \tau < \infty$

(B) $\frac{3}{4}e^{t-\tau}$ for $-\infty < \tau < \infty$

(C) $\frac{1}{2}e^{-2\tau}$ for $-\infty < \tau < \infty$

(D) $\frac{1}{2}e^{-|t|}$ for $-\infty < \tau < \infty$

Answer: (B)

49. The response of an LTI system to u(t) is $g(t) = \left(2e^{-t} - e^{-5t}\right)u(t)$. What is the response, when $x(t) = 1$?

(A) 0

(B) 2

(C) 5

(D) 7

Answer: (A)

50. What is the value of x(t) for t > 0 from the given Laplace transform?

$$X(s) = \frac{s^2 + 3s + 3}{(s+1)(s-2)(s+5)}$$

(A) $\frac{1}{5} + \frac{2}{3}e^{-3t}$

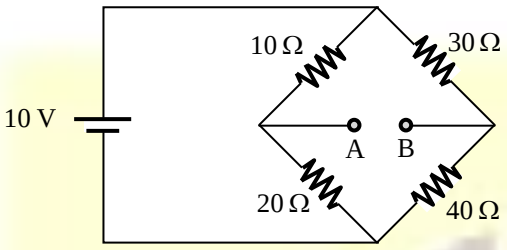
(B) $-\frac{1}{12}e^{-t} + \frac{13}{21}e^{2t}$

(C) $\frac{1}{12}e^{t} + \frac{13}{21}e^{-2t} + \frac{13}{28}e^{5t}$

(D) $-\frac{1}{12}e^{-t} + \frac{13}{21}e^{2t} + \frac{13}{28}e^{-5t}$

Answer: (D)

51. What is the value of V_{AB} in the network shown in the figure?



(A) 0.86 V

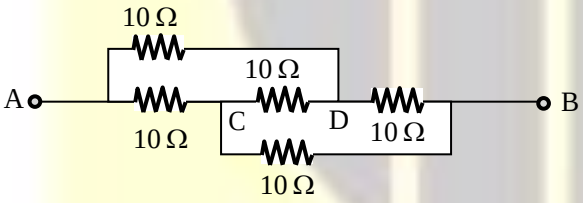
(B) 0.96 V

(C) 0.66 V

(D) 0.76 V

Answer: (B)

52. Five resistances of 10 Ω each are connected between terminals A and B as shown in the figure. What is the total resistance between terminals A and B?



(A) 5 Ω

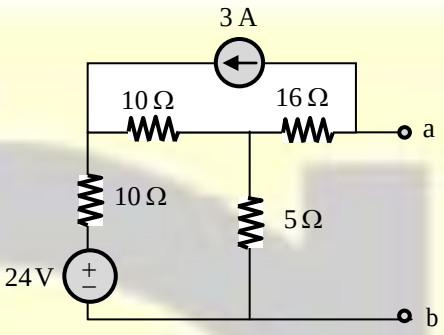
(B) 10 Ω

(C) 15 Ω

(D) 20 Ω

Answer: (B)

53. The Thevenin equivalent circuit voltage and resistance for the given circuit between terminals a and b are respectively



(A) 49.2 V, 10 Ω

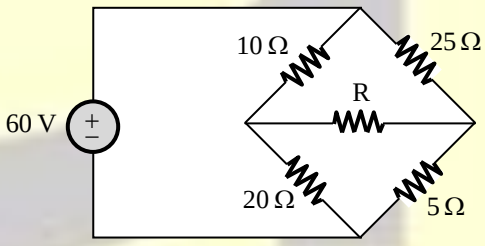
(B) –49.2 V, 15 Ω

(C) –49.2 V, 20 Ω

(D) 49.2 V, 20 Ω

Answer: (C)

54. What is the maximum power that can be delivered to the variable resistor R in the circuit?



(A) 15.77 W

(B) 18.77 W

(C) 19.77 W

(D) 20.77 W

Answer: (D)

55. Consider the following statements regarding the initial conditions for inductor and capacitor:

1. If there is no current flowing through the inductor at $t = 0^-$, the inductor will act as an open circuit at $t = 0^+$.

2. If there is no voltage across the capacitor at $t = 0^-$, the capacitor will act as an open circuit at $t = 0^+$.

3. If a current of value I_0 flows through the inductor at $t = 0^-$, the inductor can be regarded as a current source of I_0 ampere at $t = 0^+$.

Which of the above statements is/are correct?

(A) 1 only

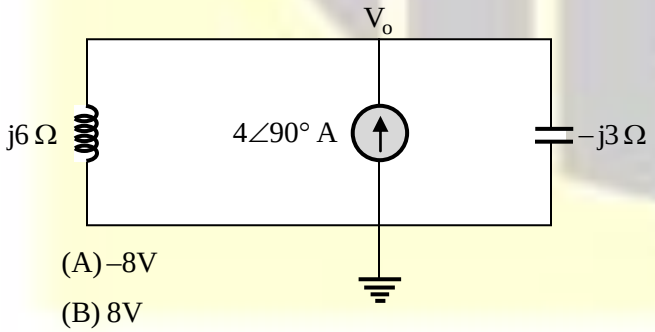
(B) 2 only

(C) 1 and 3 only

(D) 1, 2 and 3

Answer: (C)

56. What is the value of voltage V_o shown in the circuit?



(A) –8V

(B) 8V

(C) 24V

(D) –24V

Answer: (C)

57. The value of the power consumed by the balanced star-connected load in terms of the balanced delta-connected load is

(A) $P_Y = \left[\frac{P_\Delta}{\sqrt{3}}\right]$

(B) $P_Y = \left|\sqrt{3}P_\Delta\right|$

(C) $P_Y = \left[\frac{P_\Delta}{3}\right]$

(D) $P_Y = \left[3P_\Delta\right]$

Answer: (C)

58. The Z parameters of a two-port network are $Z_{11} = 20\,\Omega, Z_{22} = 30\,\Omega, Z_{12} = Z_{21} = 10\,\Omega$. The corresponding values of ABCD parameters are

(A) $\begin{bmatrix} 2 & 0.1 \\ 50 & 3 \end{bmatrix}$

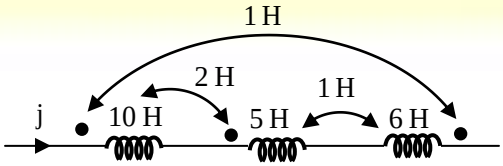
(B) $\begin{bmatrix} 3 & 50 \\ 0.1 & 2 \end{bmatrix}$

(C) $\begin{bmatrix} 2 & 40 \\ 0.1 & 3 \end{bmatrix}$

(D) $\begin{bmatrix} 2 & 50 \\ 0.1 & 3 \end{bmatrix}$

Answer: (D)

59. What is the value of equivalent inductance of the network shown in the figure?



(A) 19 H

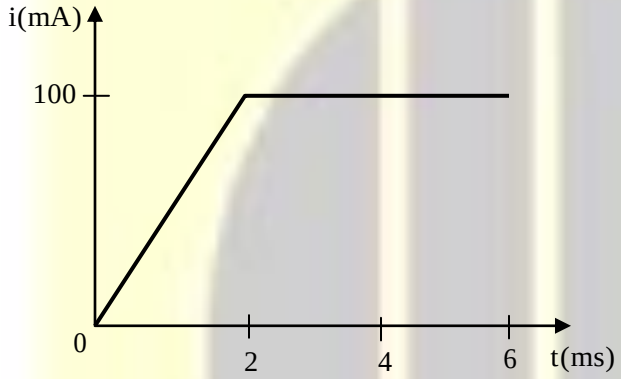
(B) 21 H

(C) 23 H

(D) 25 H

Answer: (B)

60. An initially uncharged 1 mF capacitor has the current shown in the figure. What is the voltage across it at t = 2 ms?



(A) 50 mV

(B) 100 mV

(C) 200 mV

(D) 250 mV

Answer: (B)

61. Two perfectly coupled, coils each of 1H self-inductance are connected in parallel so as to aid each other. What is the value of overall inductance?

(A) 0 H

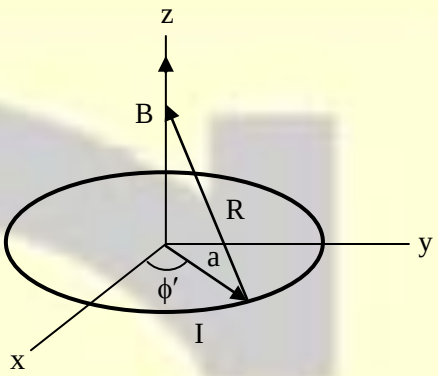
(B) 0.5 H

(C) 1 H

(D) 2 H

Answer: (B)

62. What is the value of magnetic field on the axis that is perpendicular to the plane containing a circular loop of current shown in the figure using the Biot-Savart law?



(A) $B(z)=\left[\frac{\mu_0 m}{2\pi R^3}\right]$

(B) $B(z)=\left[\frac{\mu_0 m}{2\pi R^2}\right]$

(C) $B(z)=\left[\frac{\mu_0 m}{2\pi R^4}\right]$

(D) $B(z)=\left[\frac{\mu_0 m}{2\pi R}\right]$

Answer: (A)

63. What is the transfer function, G(s) = C(s)/R(s), corresponding to the following differential equation?

$$\frac{d^3c}{dt^3}+4\frac{d^2c}{dt^2}+6\frac{dc}{dt}+3c=\frac{d^2r}{dt^2}+6\frac{dr}{dt}+4r$$

(A) $G(s)=\frac{s^2+6s+4}{s^3+4s^2+6s+3}$

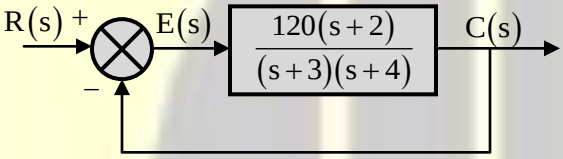
(B) $G(s)=\frac{s^2+5s+4}{s^3+4s^2+6s+3}$

(C) $G(s)=\dfrac{s^2+6s+4}{s^3+5s^2+6s+3}$

(D) $G(s)=\dfrac{s^2+6s+4}{s^3+4s^2+5s+3}$

Answer: (A)

64. What are the steady-state errors for the inputs of 3u(t), 3tu(t) and $3t^2u(t)$ respectively to the system shown in the figure, where the function u(t) is the unit step?



(A) $\dfrac{3}{21},\infty$ and ∞

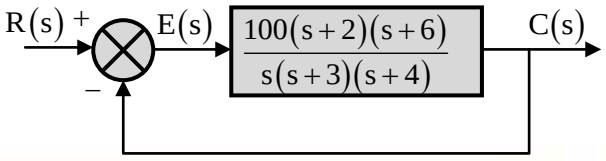
(B) $\dfrac{1}{6},\infty$ and $\dfrac{1}{6}$

(C) ∞,∞ and $\dfrac{1}{6}$

(D) $\dfrac{1}{6},\infty$ and $\dfrac{3}{21}$

Answer: (A)

65. What are the steady-state errors for the inputs of 4u(t), 4tu(t) and $4t^2u(t)$ respectively to the system shown in the figure, where the function u(t) is the unit step



(A) $0,\infty$ and ∞

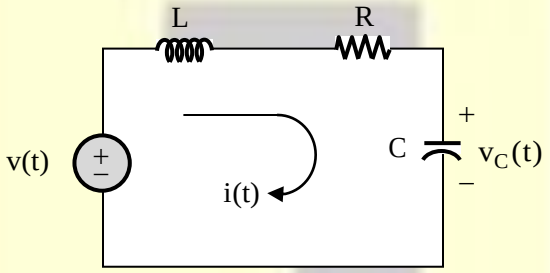
(B) $0,\dfrac{1}{25}$ and ∞

(C) ∞,∞ and $\dfrac{1}{25}$

(D) $\dfrac{1}{25},\infty$ and 0

Answer: (B)

66. The transfer function of the given circuit shown in the figure by using Laplace transform is



(A) $T(s)=\dfrac{\dfrac{1}{LC}}{s^2+\dfrac{R}{L}s+\dfrac{1}{LC}}$

(B) $T(s)=\dfrac{\dfrac{1}{LC}}{s^2+Rs+\dfrac{1}{LC}}$

(C) $T(s)=\dfrac{\dfrac{1}{LC}}{s^2+\dfrac{R}{L}s+\dfrac{1}{LC}}$

(D) $T(s)=\dfrac{\dfrac{1}{LC}}{s^2+\dfrac{1}{L}s+\dfrac{1}{LC}}$

Answer: (A)

67. What is the status of the closed-loop transfer function

$$T(s)=\frac{10}{s^5+2s^4+4s^3+6s^2+2s+5}$$

using Routh-Hurwitz criterion?

(A) Unstable

(B) Marginally stable

(C) Stable

(D) Neither stable nor unstable

Answer: (A)

68. What is/are the value(s) of K for which the system is stable for the characteristic equation $s^2-(K+2)s+(2K+1)=0$?

(A) $-(K+2)>0$ and $(2K+5)>0$

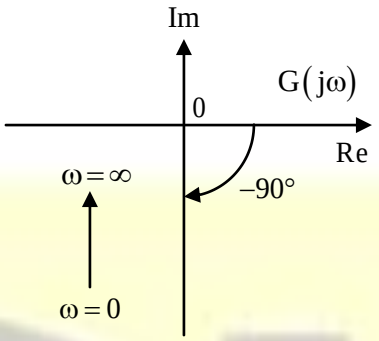
(B) $K=-2$ and $K=-2.5$

(C) $K<-2$ or $K>2.5$

(D) $-(K+2)<0$ and $(2K+5)>0$

Answer: (A)

69. Which one of the following is the correct transfer function obtained from the Nyquist diagram shown in the figure?



(A) $G(s)=\dfrac{1}{s}$

(B) $G(s)=K$

(C) $G(s)=\dfrac{1}{s^2}$

(D) $G(s)=s$

Answer: (A)

70. Which one of the following statements is correct regarding root locus technique?

(A) It can be used to analyzeand design the effect of loop gain upon the system's transient response and stability.

(B) It cannot be used to analyze and design the effect of loop gain upon the system's transient response and stability.

(C) It can be used to analyze and design the effect of loop gain upon the system's transient response only.

(D) It can be used to analyze and design the effect of loop gain upon the system's stability only.

Answer: (A)

71. Thetransfer function of a single,passive lag-lead network is

(A) $G_c(s)=\left[\left(s+\frac{1}{T_1}\right)\Big/\left(s+\frac{\gamma}{T_1}\right)\right]\left[\left(s+\frac{1}{T_2}\right)\Big/\left(s+\frac{1}{\gamma T_2}\right)\right]$

(B) $G_c(s)=\left[\left(s+\frac{1}{T_1}\right)\Big/\left(s+\frac{\gamma}{T_1}\right)\right]\left[\left(s+\frac{1}{T_2}\right)\Big/\left(s+\frac{\gamma}{T_2}\right)\right]$

(C) $G_c(s)=\left[\left(s+\frac{1}{T_1}\right)\Big/\left(s+\frac{1}{\gamma T_1}\right)\right]\left[\left(s+\frac{1}{T_2}\right)\Big/\left(s+\frac{\gamma}{\gamma T_2}\right)\right]$

(D) $G_c(s)=\left[\left(s+\frac{1}{T_1}\right)\Big/\left(s+\frac{\gamma}{T_1}\right)\right]\left[\left(s+\frac{\gamma}{T_2}\right)\Big/\left(s+\frac{1}{T_2}\right)\right]$

Answer: (*)

72. Which one of the following statements is correct regarding state variable approach over transfer function approach?

(A) The state variable can be fedback, it considers the initial conditions and state model of a system is unique.

(B) The state variable can be fedback, it considers the initial conditions and statemodel ofa system isnotunique.

(C) The state variable cannot be fedback, it considers the initial conditions and state model of a system is unique.

(D) The state variable can be fedback, it neglects the initial conditions and state model of a system is not unique.

Answer: (B)

73. What is the controllability of the state equation for the given system?

$$\dot{x}=Ax+Bu=\begin{bmatrix}-1 & 1 & 0\\ 0 & -1 & 0\\ 0 & 0 & -2\end{bmatrix}x+\begin{bmatrix}0\\1\\1\end{bmatrix}u$$

(A) Thesystem iscontrollable

(B) Thesystem isnot controllable

(C) Itisnotpossibletofindthe controllability

(D) It is neither controllable nor stable

Answer: (A)

74. If the initial-state vector, $x(t_0)$, can be found from u(t) and y(t), measured over a finite interval of time from t_0 ,then the system is

(A) unobservable

(B) observable

(C) Not possible to find the observability

(D) Neither unobservable nor observable

Answer: (B)

75. The opne-loop transfer function of a unity feedback system is $G(s)=\frac{20}{0.21s+1}$. What is the time response subjected to a step input $X(s)=0.8/s$?

(A) $0.76\left(1-e^{-t/100}\right)$

(B) $0.76\left(1-e^{-t/0.01}\right)$

(C) $0.95\left(1-e^{-t/100}\right)$

(D) $0.95\left(1-e^{-t/0.01}\right)$

Answer: (B)

76. A set of independent current measurements is recorded as 10.03A, 10.10A, 10.11A and 10.08A. What are the values of average current and range of error respectively?

(A) 10.08 A and ± 0.03A

(B) 10.08A and ± 0.04 A

(C) 10.09A and ± 0.04A

(D) 10.09A and ± 0.03A

Answer: (B)

77. During the measurement of low resistance using a potentiometer, the following readings were obtained:

The voltage drop across the low resistance under test = 0.4221 V

The voltage drop across a 0.1Ω standard resistance = 1.0235 V

What are the values of unknown resistance and current respectively?

(A) 0.041208Ω and ± 10.235 A

(B) 0.031208 Ω and $\pm$ 10.235 A

(C) 0.021208Ω and ± 10.235 A

(D) 0.041208Ω and ± 11 .235A

Answer: (A)

78. The coil of a moving-coil voltmeter is 40 mm long and 30 mm wide, and has 100turnsonit.Thecontrolspring exerts a torque of 240×10^{-6} N-m when thedeflection is100divisionsonfullscale. If the flux density of the magnetic fieldintheairgapis $1.0\ Wb/m^2$, what isthevalue of the resistance that must beput in series with the coilto giveonevoltper division byneglecting theresistance ofthe voltmeter coil?

(A) 5 kΩ

(B) 15 kΩ

(C) 50 kΩ

(D) 75 kΩ

Answer: (C)

79. Which one of the following statements is correct regarding moving-iron instrument when voltages or currents are measured?

(A) It indicates the same value of the measurement for both ascending and descending values.

(B) Itindicates the higher value of the measurement forascending values.

(C) It indicates the higher value of the measurement for descending values.

(D) It indicates the lower value of the measurement for descending values.

Answer: (C)

80. A moving-coil instrument gives a full-scale deflection of 10mA, when the potentiall difference across its terminals is100mV.What is the value of shunt resistance for a full-scale deflection corresponding to100A?

(A) $0.0001\,\Omega$

(B) $0.001\,\Omega$

(C) $0.01\,\Omega$

(D) $0.1\,\Omega$

Answer: (B)

81. The power in a three-phase circuit is measured with the help of 2 wattmeters. The reading of one of the wattmeters is positive and that of the other is negative. The magnitudes of readings are different. What is the value of the power factor of the circuit under this condition?

(A) 0.5(lagging)

(B) Zero(lagging)

(C) Lessthan 0.5(lagging)

(D) Unity

Answer: (C)

82. What is the range of frequency measured bythetypical frequencymeter?

(A) 1MHz

(B) 10 Hz

(C) 1kHz

(D) 1GHz

Answer: (D)

83. A $3\frac{1}{2}$ – digit DVM has an accuracy specification of ± 0.5 percent of reading ± 1 digit. What is the possible error in volt, when the instrument is reading 5.00V on the 10V range?

(A) 0.015 V

(B) 0.025V

(C) 0.035V

(D) 0.045V

Answer: (C)

84. Which one of the following statements is correct regarding potentiometric recorders?

(A) A sensitivity of 4VB/mmis attained with an error of less than ±0.25%with a bandwidth of 0.8Hz.

(B) A sensitivityof10VB/mm is attained with an error of less than ±0.35% with a bandwidth of 0.9Hz.

(C) A sensitivity of 5VB/mm is attained with an error of less than±0.25%withabandwidth of1Hz.

(D) A sensitivity of 8VB/mm is attained with an error of less than ± 0.45% with a bandwidth of 0.8Hz.

Answer: (A)

85. If the bandwidth of an oscilloscope is given as direct current to10 MHz, what isthe fastest rise time a sine wave can have to be accurately reproduced by the instrument?

(A) 35ns

(B) 17.5 ns

(C) 0.175 μs

(D) 35 μs

Answer: (A)

86. What is the key factor that must be considered while selecting a transducer fora particular application?

(A) Only the input characteristics should be considered

(B) Only the output characteristics should be considered

(C) Only the transfer characteristics should be considered

(D) Input, output and transfer characteristics should be considered

Answer: (D)

87. If a transducer has an output impedance of $1\,\Omega$ and a load resistance of $1\,k\Omega$, it behaves as

(A)a constant current source

(B)a constant voltage source

(C) a constant power source

(D)a constant energy source

Answer: (B)

88. If a 50Hz, 220/400V, 50kVA, single-phase transformer operates on 220V, 40Hz supply with secondary winding, then what about the core losses of the transformer?

(A) The hysteresis losses and the eddy current losses of the transformer increase

(B) The hysteresis losses and the eddy current losses of the transformer decrease

(C) The hysteresislosses remain same whereas the eddy current losses decrease

(D) Thehysteresislossesincrease whereas the eddy current losses remain same

Answer: (B)

89. An 1100/415V, delta-star transformer feeds power to a 30kW, 415V, three-phase induction motor having an efficiency of 90% and full-load p.f.0.833. What are the rating of the transformer and line current of low voltage side respectively?

(A) 35kVA, 55.65A

(B) 40kVA, 55.65A

(C) 40kVA, 45.65A

(D) 45kVA, 55.65A

Answer: (B)

90. ThekVAratingofanordinarytwo- winding transformerincreases whenconnectedasanautotransformer because

(A) transformation ratio increases

(B) secondary current increases

(C) energyistransferredboth inductively and conductively

(D) secondary voltage increases

Answer: (C)

91. Thelap-connectedarmaturewinding is suitable for

(A) low-voltageandhigh-current generators

(B) low-voltageandlow-current generators

(C) high-voltageandlow-current generators

(D) high-voltageandhigh-current generators

Answer: (A)

92. Which one of the following statements is not correct regarding inter poles of DC machines?

(A) They are small yoke-fixedpoles spaced in between themain poles.

(B) Their polarity, in the case of generators, is the same as that of the main pole ahead.

(C) They are connected in parallel with the armature so that they carry part of the armature current.

(D) They automatically neutralize not only reactance voltage but cross- magnetization as well.

Answer: (C)

93. ADC series motor, running a fan at 1000 r.p.m., takes 50A from 250V mains. The armature plus field resistance is $0.6\,\Omega$. If an additional resistance of $4.4\,\Omega$ is inserted in series with the armature circuit, what is the value of the motor speed when the field flux is proportional to the armature current?

(A) 621r.p.m.

(B) 641r.p.m.

(C) 651r.p.m.

(D) 661r.p.m.

Answer: (B)

94. A three-phase, 60Hz, 25hp, wye-connected induction motor operates at a shaft speed of almost1800r.p.m.at no load and1650r.p.m.at full load. What are the values of speed of the rotor field with respect to the rotor itself and with respect to the stator field respectively?

(A) 150 r.p.m.and1800r.p.m.

(B) 1650r.p.m.and 0r.p.m.

(C) 150 r.p.m.and 0r.p.m.

(D) 1800r.p.m.and 150 r.p.m.

Answer: (C)

95. Therotorinputofathree-phase induction motor runningwith a slip of10% is100kW.What is the value of thegross power developed bytherotor?

(A) 10kW

(B) 80kW

(C) 90kW

(D) 95kW

Answer: (C)

96. What is the value of percentage voltage regulation of an alternator having 0.75 leading power factor loads, when the no-load induced

e.m.f. is 2400V and the rated terminal voltage is3000 V?

(A) 20%

(B) –20%

(C) 25%

(D) –25%

Answer: (B)

97. Two identical alternators are running in parallel and carry equal loads.What willhappen if the excitation of one alternator is increased without changing itssteam supply?

(A) Itwill keepsupplyingalmostthe same load

(B) kVAR supplied by it would decrease

(C) kVA supplied by it would decrease

(D) Itspower factor will increase

Answer: (A)

98. Asynchronous motor connected to infinite bus-bar has, at constant full load, 100% excitation and unity power factor. Whenthereisachangein excitation only, the armature current will have

(A) leading power factor with under excitation

(B) lagging power factor with over excitation

(C) leading power factor with overexcitation

(D) no change inpower factor

Answer: (C)

99. What are the values of maximum step rate for permanent-magnet and variable reluctance stepper motors respectively?

(A) 300 pulses per second and 1200 pulses per second

(B) 700 pulses per second and 1200 pulses per second

(C) 1200 pulses per second and 1200 pulses per second

(D) 300 pulses per second and 300 pulses per second

Answer: (A)

100. Consider the following statements regarding ideal transformer:

1. The winding resistances of the primary and secondary of the transformer are zero.

2. The eddy current loss of the transformer is zero.

3. The core of the transformer is having a finite permeability.

Which of the above statements is/are not correct?

(A) 1 and 3

(B) 2 only

(C) 3 only

(D) 1 and 2

Answer: (C)

101. Consider the following characteristics of Complex Instruction Set Computer (CISC) processor:

1. It is having a small number of instructions.

2. It is having less addressing modes.

3. Most instructionscanmanipulate operands in thememory.

4. Control unit ismicroprogrammed.

Which of the above characteristics is/ are not correct?

(A) 1only

(B) 1and2

(C) 1and 4

(D) 3 and4

Answer: (B)

102. In which of the following processors, the designer can add easily new instruction without changing the architecture of the processor?

(A) CISCprocessor only

(B) RISCprocessor only

(C) BothCISCand RISCprocessors

(D) Neither CISC process or nor RISC processor

Answer: (A)

103. Whichoneofthefollowing isusedto increase the performance ofCPUthat meansexecuting moreinstructionsin less time?

(A) Sequencing

(B) Pipelining

(C) Scheduling

(D) Spooling

Answer: (B)

104. Whichoneofthefollowing buseswas designedtoimprovebandwidthand decrease latency in computer systems?

(A) PCIbus

(B) VESAbus

(C) EISAbus

(D) ISAbus

Answer: (A)

105. ConsiderthefollowingfunctionsofRootHub:

1. Itperformspowerdistributionto the devices.
2. Itenables and disables the ports.
3. Itreports statusofeachportto the user.

Whichoftheabovefunctionsis/are correct?

(A) 1only

(B) 2 and 3 only

(C) 1and 2only

(D) 1,2and3

Answer: (C)

106. InDouble Data Rate SDRAM, if100MHz clockrateand64bitsdatabus transfers data, then what isthe approximate transfer rate forDDR3?

(A) 1600MB/s

(B) 6400MB/s

(C) 3200MB/s

(D) 800MB/s

Answer: (C)

107. What isthe approximate rotationaldelay if the disk drive has 8 surfaces, each surface has1024tracks, each track has 64 sectors, each sector can hold 512 bytes and rotation speed of 6000 r.p.m.? (It is assumed that the sector is away from head half of the track)

(A) 0.005s

(B) 0.050s

(C) 0.500s

(D) 0.505s

Answer: (A)

108. How many pages are in the disk, if the capacity of a virtual disk is 2MB and each page is2 kB in a byte-addressable system?

(A) 2048

(B) 1024

(C) 100

(D) 500

Answer: (B)

109. Which one of the following is used to keep the track of program statistics that may be a valuable tool for system administrators who wish to reconfigure the system to improve computing services?

(A) Programming table

(B) Spooling

(C) Logging

(D) Making file

Answer: (C)

110. If communicating processes reside in a temporary queue and the queue has a maximum length of zero, then the link cannot have any messages waiting in it. The sender must block until the recipient receives the message. In what way can such queues be implemented?

(A) Bounded capacity

(B) Unbounded capacity

(C) Non-zerocapacity

(D) Zerocapacity

Answer: (D)

111. Consider the following set of processes that arrive at time 0 with the length of the CPU burst given in milliseconds:

Process	Burst time
P_1	24
P_2	3
P_3	3

What isthe average waiting time under the Round-Robin Scheduling, if weuse a time quantum of 4 milli seconds?

(A) 5.66milliseconds

(B) 3.50milliseconds

(C) 7.00milliseconds

(D) 6-55milliseconds

Answer: (A)

112. Consider the following set of processes, assumed to have arrivedattime0intheorder $P_1, P_2, .., P_5$, with the length of the CPU burst given in milliseconds

Process	Burst time	Priority
P_1	10	3
P_2	1	1
P_3	2	4
P_4	1	5
P_5	5	2

Assuming that low numbers represent high priority, what is the average waiting time under the priority scheduling?

(A) 5.66milliseconds

(B) 4.50milliseconds

(C) 8.20milliseconds

(D) 6-55milliseconds

Answer: (C)

113. Which one of the following statements is correct regarding super heaters in steam power plants?

(A) In modern utility high-pressure boilers, more than 40%of the total heat absorbed in the generation of steam takes place in the super heaters.

(B) In modern utility high-pressure boilers, less than 40% of the total heat absorbed in the generation of steam takes place in the super heaters.

(C) In modern utility high-pressure boilers, less than 20% of the total heat absorbed in the generation of steam takes place in the super heaters.

(D) In modern utility high-pressure boilers, less than 30% of the total heat absorbed in the generation of steam takes place in the super heaters.

Answer: (A)

114. What are the advantages of bundle conductors?

(A) Reactance is reduced, GMR is increased and voltage gradient is reduced

(B) Surge impedance is reduced, GMR is decreased and voltage gradient is increased

(C) Reactance is increased, GMR is increased and voltage gradient is reduced

(D) Corona loss is reduced, GMR is increased and voltage gradient is increased

Answer: (D)

115. If theloading of thelineislessthan the surgeimpedance loading, thenwhich one ofthefollowingstatementsis correct?

(A) Theabsorbedreactivepoweris greater than thegenerated reactive power andreceiving-end voltage is greater thansending-end voltage.

(B) The absorbed reactive power is less than thegeneratedreactive power and receiving-end voltage is greater than sending-end voltage.

(C) Theabsorbedreactivepoweris greater than the generated reactive powerandreceiving-end voltage is lessthansending-end voltage.

(D) Theabsorbed reactive power is less than thegeneratedreactive power andreceiving-end voltageisless thansending-end voltage.

Answer: (B)

116. What are the overall diameter and diameter of metal sheath of a single-core cable respectively for working voltage of 80 kV, the dielectric strength of the insulating material being 60 kV/cm?

(A) 2.66 cm and 2.66e cm

(B) 3.66 cm and 3.66e cm

(C) 4.66 cm and 4.66e cm

(D) 3.66 cm and 2.66e cm

117. Which one of the following is correct regarding reduction of corona loss?

(A) Corona losses can be reduced by using large diameter conductors, hollow conductors and bundled conductors

(B) Corona losses can be reduced by using small diameter conductors, hollow conductors and bundled conductors

(C) Corona losses can be reduced by using large diameter conductors, hollow conduct or sand single conductors

(D) Corona losses can be reduced by using large diameter conductors, solid conductors and single conductors

Answer: (B)

118. Whichoneofthefollowingtypesofrelay isused togivedirectional featuretoreactance relay?

(A) IDMT relay

(B) Impedance relay

(C) Mhorelay

(D) Non-directional reactancerelay

Answer: (C)

119. What are the values of breaking current and making current of a circuit breaker respectively, ratedat1000A, $2000\sqrt{3}$ MVA,20kV,3s,oilcircuit breaker?

(A) 100 kAand 255kA

(B) 200kAand 255kA

(C) 100 kAand 200kA

(D) 200kAand 200kA

Answer: (A)

120. The nodal admittance formulation, using thenodal voltages astheindependent variables, isthemost economic

(A) in the view of computer time only

(B) in the view of computer memory only

(C) in the view of both computer time and memory

(D) in the view of stability

Answer: (C)

121. A 50Hz, four-pole turbo-generator rated at 30 MVA, 13.2 kV has an inertia constant of H =10 kW-s/kVA. What is the value of kinetic energy stored in the rotor at synchronous speed?

(A) 180 megajoules

(B) 200 megajoules

(C) 300 megajoules

(D) 400 megajoules

Answer: (C)

122. Which of the following is correct regarding the advantages of DC transmission over AC transmission?

(A) Power perconductor ismore,more corona lossandpossibilityof higher operating voltages

(B) Power perconductor ismore,less corona lossandpossibilityof higher operating voltages

(C) Powerperconductorismore,no skin effect and possibility oflower operating voltages

(D) Power per conductor is more, there is charging current and possibility of higher operating voltages

Answer: (C)

123. Which one of the following statements is correct regarding shunt/ series capacitor?

(A) Shunt capacitor improves the power factor whereas series capacitor improves the stability of transmission line.

(B) Series capacitor improves the power factor where as shunt capacitor improves the stability of transmission line.

(C) Shunt capacitor improves both the power factor and the stability of transmission line.

(D) Series capacitor improves both the power factor and the stability of transmission line.

Answer: (A)

124. In smartgrid, the model load, FACTS devices and control, protectionplatform ascompared toconventionalgridare respectively

(A) dynamic,specifiedandadaptive nature

(B) dynamic,adaptiveandadaptive nature

(C) dynamic,adaptiveanddefined nature

(D) static,adaptiveandadaptive nature

Answer: (A)

125. Alarge hydropower station has ahead of324mandanaverageflowof$1370\ m^3/s$. Thereservoirofwaterbehind the dams and dikes is composed ofseriesoflakescoveringanarea of $6400\ km^2$. Whatistheavailable hydraulicpower?

(A) 4350 kW

(B) 4350MW

(C) 435MW

(D) 435kW

Answer: (B)

126. Consider the following statements regarding semiconductor diode:

1. In the non-conducting region (when the p-n junction is reverse biased), thediode current is exactly zero.
2. The diode requires a smallpositive voltage to be applied before it enters the conducting region.
3. For large input voltages and/ or currents, the diode enters break down regions in the forward direction.

Whichoftheabovestatementsis/are correct?

(A) 1and2

(B) 2only

(C) 1only

(D) 2and3

Answer: (B)

127. The mobilities of free electron sand holes in pure silicon are$1300\ cm^2/V\text{-}s$ and $500\ cm^2/V\text{-}s$ respectively. What is the value of intrinsic conductivity for silicon?(Assume $n_i = 1.5\times10^{10}\ cm^{-3}$ for silicon at room temperature)

(A) $2.69\times10^{13}\,S/cm$

(B) $4.32\times10^{-6}\,S/cm$

(C) $4.32\times10^{13}\,S/cm$

(D) $2.69\times10^{-6}\,S/cm$

Answer: (B)

128. What happens to the depletion region and the depletion region capacitance of a p-n junction diode within creased reverse-biased voltage?

(A) The depletion region shrinks and the depletion region capacitance decreases

(B) The depletion region shrink sand the depletion region capacitance increases

(C) The depletion region widen sand the depletion region capacitance decreases

(D) The depletion region widen sand the depletion region capacitance increases

Answer: (C)

129. Consider the following statements regarding voltage-divider biasina transistor:

1. The voltage-divider bias configuration uses two DC bias sources to provide forward-reverse bias to the transistor.
2. The voltage-divider bias provides a very small base current to the transistor compared to the bias current.
3. Two resistors R1 and R2 form a voltage divider that provides the base bias voltage to the transistor.

Whichoftheabovestatementsis/are correct?

(A) 1and2 only

(B) 2 and3only

(C) 2 only

(D) 1,2and3

Answer: (B)

130. In ann-type semiconductor, the Fermi level is 0.3eV below the conduction level at a room temperature of 300K. If the temperature is increased to 360 K, whatisthenewpositionof theFermi level?

(A) Remains unchanged

(B) 0.26 eV above the conduction level

(C) 0.36 eV above the conduction level

(D) 0.36 eV below the conduction level

Answer: (D)

131. Consider the following statements regarding common-base transistor amplifer:

1. In the active region, the collector base junction is forward biased while the base-emitter junction is reverse biased.
2. In the cutoff region, the collector base and base-emitter junctions of a transistor are both reverse biased.
3. In the saturation region, the collector-base and base-emitter junctions are both forward biased.

Whichoftheabove statementsis/are correct?

(A) 1and 2only

(B) 2and 3only

(C) 2only.

(D) 1 ,2and3

Answer: (B)

132. What are the biasing states of collector-base junction and base-emitter junction in the active region of a common-emitter transistor amplifier?

(A) Bothcollector-basejunctionand base-emitter junctionareforward biased

(B) Bothcollector-basejunctionand base-emitter junctionarereverse biased

(C) The collector-base junction is forward biased and the base emitter junction is reverse biased

(D) The collector-base junction is reverse biased and the base-emitter junction is forward biased

Answer: (D)

133. Match the following Lists:

List-I (n-p-n BJT operating regions)	List-II (n-p-n BJT characteristics)
P. Cutoff region	**1.** $I_C = \beta_F I_B$, $I_B > 0$, $V_{BE} > V_{BE(on)}$, $V_{CE} > V_{CB(sat)}$
Q. Saturation region	**2.** $I_C = I_B = I_E = 0$, $V_{BE} < V_{BE(on)}$, $V_{BC} < V_{BC(on)}$
R. Forward active region	**3.** $I_B > 0, I_C > 0$, $I_C < \beta_F I_B$, $V_{BE} > V_{BE(on)}$

Select the correct answer using the code given below.

(A) P-1, Q-2, R-3

(B) P-2, Q-3, R-1

(C) P-1, Q-3, R-2

(D) P-2, Q-1, R-3

Answer: (B)

134. Consider the following statements regarding negative feedback in amplifier circuits:

1. It has reduction in overall voltage gain.

2. It has enhanced frequency response.

3. It has higher output impedance.

Which of the above statements is/are correct?

(A) 1 and 2 only

(B) 2 and 3 only

(C) 2 only

(D) 1, 2 and 3

Answer: (A)

135. In the Hartley oscillator, $L_2 = 0.4\,\text{mH}$ and $C = 0.004\,\mu\text{F}$. If the frequency of the oscillator is 120 kHz, what is the value of L_1? [Neglect the mutual inductance].

(A) 4 mH

(B) 0.04 mH

(C) 0.4 mH

(D) 40 mH

Answer: (B)

136. In a Wien bridge oscillator, if the value of R is $10\,\text{k}\Omega$ and the frequency of oscillation is 10 kHz, what is the value of capacitor C?

(A) 0.159 pF
(B) 15.9 pF
(C) 159 pF
(D) 1.59 pF

Answer: (*)

137. Consider the following statements regarding frequency stability oscillator:

1. Due to change in temperature, the values of the frequency determining components, viz., resistor, inductor and capacitor are changed.
2. Frequency can affect due to variation in biasing conditionsand loading conditions.
3. The effective resistance of the tank circuit is unchanged when the load isconnected.

Whichoftheabove statementsis/ are correct?
(A) 1 and 2only
(B) 2 and 3only
(C) 2 only
(D) 1, 2 and 3

Answer: (A)

138. A power diodecanbeused asa switchbecause itsresistance canbecontrolledwith
(A) applied current
(B) small current
(C) higher current
(D) applied voltage

Answer: (D)

139. The reverse current reduces and the voltage across the power diode grows more negative during the turn off process of the power diode. This time is called
(A) fall time
(B) recovery time
(C) reverse recovery time
(D) rise time

Answer: (C)

140. What are the significant advantages of MOS power transistor over bipolar power transistor in the pulse power supplies?
(A) Very high input resistance and the input currents are of the order of nA
(B) Very low input resistance and the input currents are of the order of kA
(C) Very high input resistance and the input currents are of the order of kA
(D) Very low input resistance and the input currents are of the order of nA

Answer: (A)

141. In a gate turn off thyristor, the turning off is achieved by
(A) latching current at gate
(B) holding current at gate
(C) positive current at gate
(D) negative current at gate

Answer: (D)

142. The function of a capacitive filter in a Graetz diode bridge rectifier isto

(A) remove smallload currentripples from therectified outputsignal

(B) minimize voltage variationsin ACinput signal

(C) reduce harmonics in the rectified output signal

(D) introduce more ripples into the rectified output signal

Answer: (A, C)

143. Theuseof an inductive filter in a rectifier circuit provides satisfactory performance only when

(A) the load current is high

(B) the load voltage is high

(C) the load current is low

(D) the load voltage is low

Answer: (C)

144. If a separately excited DC motor istobe operated in the first quadrant only, the converter is used in

(A) single-phase half-controlled rectifier

(B) single-phase full-controlledrectifier

(C) single-phase dual-controlled rectifier

(D) four-quadrant chopper

Answer: (A)

145. The static Scherbius drive can able to provide

(A) variable torque control

(B) constant torquecontrol

(C) braking operation

(D) variable speed

Answer: (D)

146. Which one of the following statements is correct regarding series resonant inverter?

(A) The load current is a square waveform.

(B) The output voltage waveform depends on the damping factor of load impedance.

(C) The trigger frequency is higher than the damped resonant frequency

(D) The input voltage waveform depends on the damping factor of load impedance.

Answer: (C)

147. If a single-phase full-bridge voltage source inverter operates with R load,the nature ofoutput current is

(A) square wave

(B) sine wave

(C) triangular wave

(D) pulse wave

Answer: (A)

148. Which one of the following cores is used for large mains transformers to reduce eddy current loss of high-frequency operation in power electronic circuit?

(A) Laminated iron core

(B) Laminated steelcore

(C) Compressedferromagneticalloy core

(D) Ferromagnetic alloycore

Answer: (C)

149. When an induction motor and aheater aresupplied fromaphase-controlled single-phaseACvoltagecontroller, then

(A) only fundamental component of output voltage and current is useful in the induction motor but fundamental and harmonics are useful in theheater

(B) fundamental and harmonics are useful in the induction motor but only fundamental component of output voltage and current is useful in the heater

(C) both fundamentalandharmonics areuseful in theinduction motor and heater

(D) only harmonicsareuseful inthe induction motor and heater

Answer: (A)

150. Consider the following statements regarding IGBT:

1. It combines into it the advantages of both MOSFET and BJT.

2. It is free from second breakdown problem present in BJT.

3. It has low input impedance and high power loss.

Which of the above statements is/are correct?

(A) 1 only

(B) 2 and 3 only

(C) 1 and 2only

(D) 1, 2 and 3

Answer: (C)