TS PGECET 2026 EC

Question Paper

Conducted by JNTU, Hyderabad

General Instructions

(i) The test is of 2 hours duration.

(ii) This test paper consists of 120 questions. The maximum marks are 120.

(iii) Each question carries +1 marks for correct answer and there is no negative marking for wrong answer.

1. If $\{(2,-3,5),(1,\alpha,7),(3,\beta,3)\}$ is not a basis of the vector space $\mathbb{R}^3$, then (α,β) lies on the locus

(A) $x^2+y=5$

(B) $y^2+x=4$

(C) $x+y+6=0$

(D) $x^2+y^2=16$

---

2. Consider the linear system of equations

$$\begin{bmatrix} 3 & -1 & 4 \\ 6 & 3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

In this system of equations if x is always a fixed constant, then the system has

(A) No solution

(B) Infinite solutions

(C) Unique solution

(D) Exactly two solutions

---

3. Evaluate

$$\iint_D x^2 y \, dx \, dy,$$

where

$$D: \; x^2 + y^2 \leq 16.$$

(A) $2 \times \frac{4^5}{15}$

(B) $\pi \times \frac{4^5}{15}$

(C) 0

(D) $\pi \times \frac{4^5}{25}$

---

4. If

$$\overline{V} = x^2 y \, \overline{i} - y z^2 \, \overline{j} + x y z \, \overline{k}$$

is the linear velocity of a particle in circular motion at the point $(1, 1, 1)$**, then its angular velocity is**

(A) $-\frac{1}{2}(\overline{i} + \overline{j} + \overline{k})$

(B) 0

(C) $\frac{1}{2}(3\overline{i} - \overline{j} - \overline{k})$

(D) $\frac{1}{2}(\overline{i} + \overline{j} + \overline{k})$

---

5. Evaluate

$$\oint_C \frac{z+2}{z^2+2z+2} \, dz,$$

where C **is the circle**

$$|z - \alpha| = 1, \qquad \alpha = -1 + \frac{3}{2}i.$$

(A) 0

(B) $2\pi i$

(C) $\pi(1+i)$

(D) $\pi(2-i)$

---

6. If the solution of

$$\frac{d^2y}{dt^2} = -\frac{5}{4}y + \frac{dy}{dt},$$

satisfying

$$y(0) = 1, \qquad \left(\frac{dy}{dt}\right)_{t=0} = 0,$$

is $y(t)$, then $y(\pi) =$

(A) $e^{-2\pi}$

(B) $e^{\frac{\pi}{2}}$

(C) $5e^{-2\pi}$

(D) $4e^{\frac{\pi}{2}}$

---

7. The differential equation

$$2\frac{\partial^2 z}{\partial x^2} + 5\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} + 7\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$$

is classified as

(A) Parabolic

(B) Elliptic

(C) Hyperbolic

(D) Clairaut's equation

---

8. The joint probability density function of a two-dimensional random variable (X, Y) is

$$f(x,y) = \begin{cases} 2, & 0 < x < 1,\ 0 < y < x, \\ 0, & \textbf{otherwise}. \end{cases}$$

Which of the following is correct?

(A) X and Y are independent

(B) Marginal density function of X is $x,\ 0 < x < 1$

(C) Marginal density function of Y is $(1-y),\ 0 < y < 1$

(D) X and Y are not independent

---

9. If μ_1, μ_2 and μ_3 are the mean, median and mode respectively of a normal distribution, then

$$3(\textbf{Median}) - 2(\textbf{Mode}) = ?$$

(A) μ_1

(B) μ_2

(C) μ_3

(D) 0

---

10. Approximate positive root of the equation

$$x^2 - 7x + 9 = 0$$

using Newton-Raphson method with initial guess $x_0 = 2$.

(A) $\frac{56}{33}$

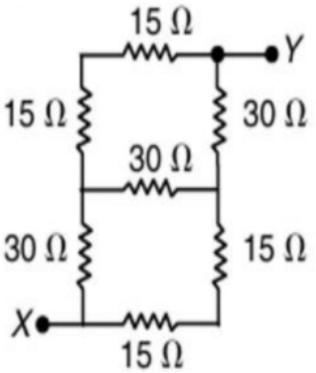
(B) $\frac{12}{5}$

(C) 23

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

---

11. The equivalent resistance between the terminal points X and Y in the given circuit is



(A) 15 Ω

(B) $\sqrt{3}$ Ω

(C) 40 Ω

(D) 30 Ω

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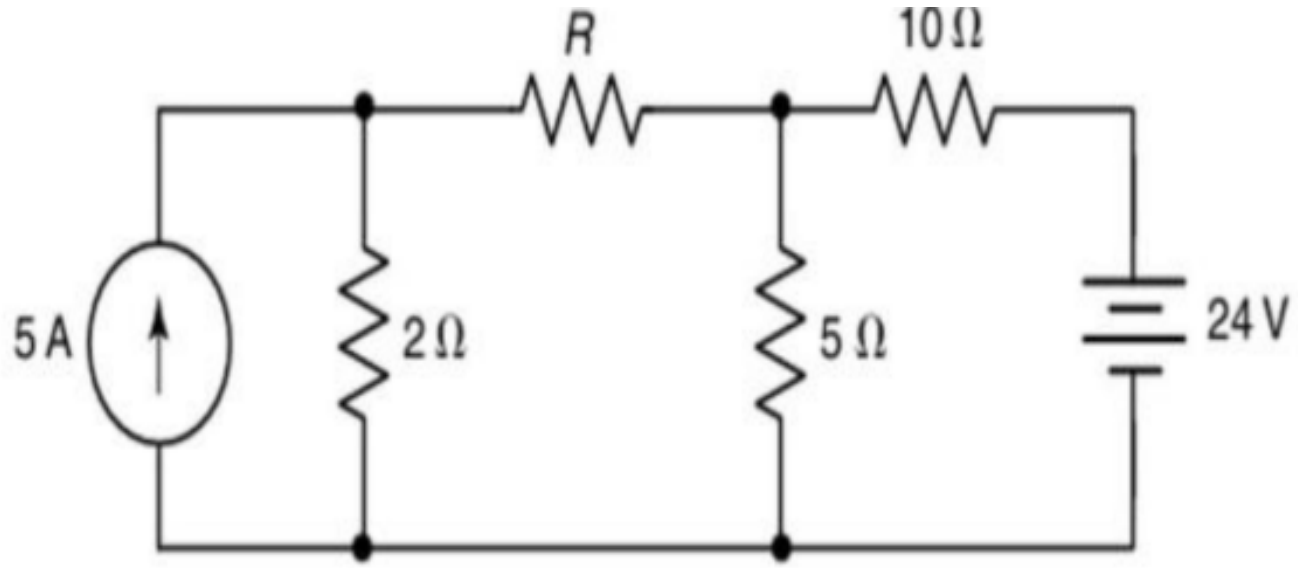
12. For the given circuit, during maximum power transfer, the value of R and the magnitude of the power delivered to R are



(A) 5 Ω and 1 W

(B) 15 Ω and 10 W

(C) 2.12 Ω and 1.233 W

(D) 5.33 Ω and 0.188 W

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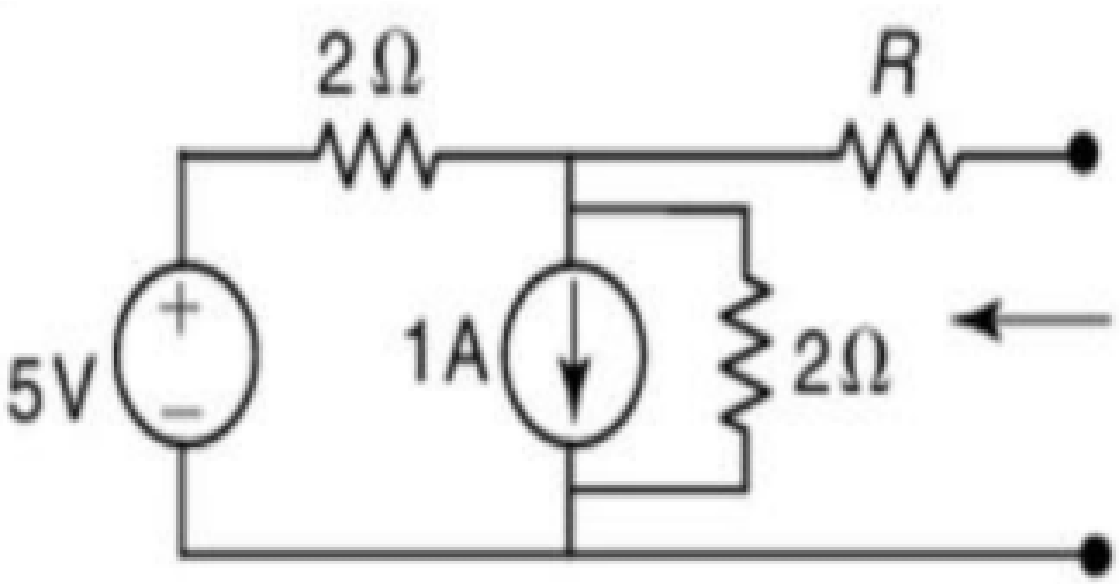
13. In the given circuit, if Thevenin's equivalent resistance is 2 Ω when seen from the open terminals, then the value of R is



(A) $> 1\ \Omega$

(B) $2\ \Omega$

(C) $4\ \Omega$

(D) $5\ \Omega$

---

14. A $10\ \Omega$ resistor, a $1\ H$ inductor and a $1\ F$ capacitor are connected in parallel. The combination is driven by a unit step current. Under steady-state conditions, the source current flows through

(A) Resistor only

(B) Inductor only

(C) Capacitor only

(D) Resistor, Inductor and Capacitor

---

15. The impulse response of an RL circuit is a

(A) Rising exponential function

(B) Decaying exponential function

(C) Step function

(D) Parabolic function

---

16. An RLC series circuit has

$$R = 1\Omega, \quad L = 1H, \quad C = 1F.$$

Damping ratio of the circuit will be

(A) Greater than unity

(B) Unity

(C) 0.5

(D) Zero

---

17. The condition for symmetry in ABCD two-port parameters is

(A) $A = B$

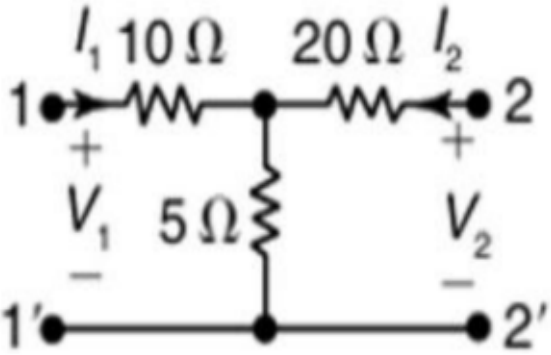
(B) $A = D$

(C) $B = C$

(D) $B = D$

---

18. What is the short-circuit impedance at port 1 for the given two-port network?



(A) 3.33 Ω

(B) 4 Ω

(C) 14 Ω

(D) 23.33 Ω

---

19. The form factor for DC supply voltage is always

(A) Zero

(B) Unity

(C) Infinity

(D) Any value between 0 and 1

---

20. The Fourier transform of a function $f(at)$ is given by

(A) $aF(\omega)$

(B) $2aF(\omega)$

(C) $1\overline{aF\left(\frac{\omega}{a}\right)}$

(D) $2\overline{aF(\omega)}$

---

21. If $f(t)$ is a periodic waveform with even symmetry, then its Fourier series expansion does not contain

(A) Sine terms

(B) Cosine terms

(C) Odd harmonics

(D) Even harmonics

---

22. The Fourier transform of a signum function is

(A) $j\pi f$

(B) $\frac{1}{j\pi f}$

(C) $j\pi f + a$

(D) $\frac{1}{j\pi f + a}$

---

23. A square-law system is/has

(A) Invertible

(B) Not invertible

(C) Distinct inputs must produce distinct outputs

(D) $x(t)$ and $x(-t)$ produce distinct outputs

---

24. If the input is

$$x[n] = -u[n] + 2u[n-3] - u[n-6]$$

and impulse response is

$$h[n] = u[n+1] - u[n-10]$$

of an LTI system, then the output $y[n]$ in the interval $5 \le n \le 9$ is

(A) $y[n] = 0$

(B) $y[n] = -(n+2)$

(C) $y[n] = n-4$

(D) $y[n] = n-9$

---

25. Find the inverse Fourier Transform of

$$X(j\omega) = \frac{j\omega + 1}{(j\omega)^2 + 5j\omega + 6}.$$

(A) $2e^{3t}u(t) + e^{2t}u(t)$

(B) $3e^{-3t}u(t) - 2e^{-2t}u(t)$

(C) $2e^{-2t}u(t) + 3e^{-3t}u(t)$

(D) $2e^{-3t}u(t) - e^{-2t}u(t)$

---

26. The Fourier Transform of

$$\frac{d}{dt}\left(e^{-at}u(t)\right)$$

is

(A) $\delta(t)$

(B) $-ae^{-at}u(t)$

(C) $\dfrac{a}{a + j\omega}$

(D) $\dfrac{j\omega}{a + j\omega}$

---

27. Overlap in the shifted replicas of the original spectrum after sampling is termed

(A) Offset

(B) Bandwidth

(C) Aliasing

(D) Anti-aliasing

---

28. The Fourier Transform of the sampled signal is given by

(A) The multiplication of shifted versions of the impulse signals

(B) The original signal's Fourier Transform

(C) A finite sum of unit step signal's Fourier Transform

(D) An infinite sum of shifted versions of the original signal's Fourier Transform

---

29. Determine the conditions on the sampling interval T such that

$$x(t) = \frac{\cos(2\pi t)\sin(\pi t)}{\pi t} + \frac{2\sin(6\pi t)\sin(2\pi t)}{\pi t}$$

is uniquely represented by the discrete-time sequence $x[n] = x(nT)$.

(A) 1

(B) $\frac{1}{6}$

(C) $\frac{1}{8}$

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

---

30. N-point DFT using FFT algorithms (radix-2) requires the following complex multiplications

(A) N

(B) $2N$

(C) $\log_2 N$

(D) $N \log_2 N$

---

31. A relaxed linear time-invariant system with impulse response

$$h(n) = a^n u(n), \qquad |a| < 1$$

when the input is a unit step sequence,

$$x(n) = u(n),$$

then the output $y(\infty)$ of the system is

(A) $\frac{1+a^{(n+1)}}{1+a}$

(B) $\frac{1-a^{(n-1)}}{1+a}$

(C) $\frac{1-a^{(n+1)}}{1-a}$

(D) $1-a$

---

32. Determine the z-transform of the signal

$$x(n) = a^n(\sin \omega_0 n)u(n)$$

(A)

$$\frac{az^{-1}\cos\omega_0}{1-2az^{-1}\sin\omega_0 - a^2z^{-2}}, \quad |z| > |a|$$

(B)

$$\frac{az^{-1}\cos\omega_0}{1+2az^{-1}\cos\omega_0 - a^2z^{-2}}, \quad |z| < |a|$$

(C)

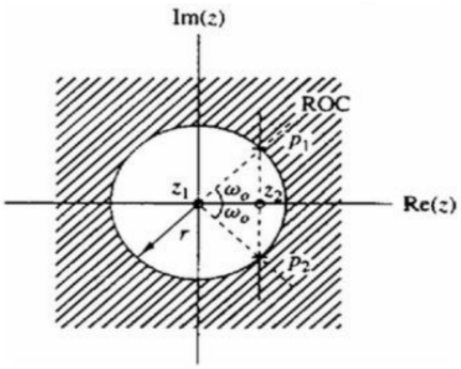
$$\frac{az^{-1}\sin\omega_0}{1-2az^{-1}\cos\omega_0 + a^2z^{-2}}, \quad |z| > |a|$$

(D)

$$\frac{az^{-1}\sin\omega_0}{1-2az^{-1}\cos\omega_0 - a^2z^{-2}}, \quad |z| < |a|$$

---

33. Determine the z-transform corresponding to the given pole-zero plot.



(A)

$$X(z) = G\frac{(z + r\cos\omega_0)}{(z - re^{j\omega_0})(z - re^{-j\omega_0})}, \qquad |z| < r$$

(B)

$$X(z) = G\frac{(z + r\cos\omega_0)}{(z + re^{j\omega_0})(z - re^{-j\omega_0})}, \qquad |z| < r$$

(C)

$$X(z) = G\frac{z(z - r\cos\omega_0)}{(z - re^{j\omega_0})(z - re^{-j\omega_0})}, \qquad |z| > r$$

(D)

$$X(z) = G\frac{z(z + r\cos\omega_0)}{(z + re^{j\omega_0})(z - re^{-j\omega_0})}, \qquad |z| > r$$

---

34. A linear time-invariant system is characterized by

$$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}.$$

Which of the following is not correct?

(A) System is stable in $\frac{1}{2} < |z| < 3$

(B) System is unstable in $|z| > 3$

(C) System is causal, its ROC is $|z| > 3$ and system is stable

(D) System is anti-causal, its ROC is $|z| < \frac{1}{2}$ and system is unstable

---

35. If all the frequency components of the input signal undergo the same time delay, then the value of the group delay of the system is

(A) Zero

(B) Unity

(C) Constant

(D) Infinity

---

36. A typical resistance value for a 1-cubic centimeter sample of semiconductor is

(A) $> 10\ \Omega/cm^3$

(B) $10^{-6}\ \Omega/cm^3$

(C) $10^{-16}\ \Omega/cm^3$

(D) $10^{-14}\ \Omega/cm^3$

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37. The charge carriers move gradually from the region of high carrier density to low carrier density constitutes an electric current is

(A) Drift current

(B) Diffusion current

(C) Leakage current

(D) Current density

---

38. The forward resistance for silicon diode carrying a current of $20\ mA$ **is**

(A) $15\ \Omega$

(B) $35\ \Omega$

(C) $50\ \Omega$

(D) $20\ k\Omega$

---

39. The diode current equation is

(A)

$$I_0\left(e^{\frac{V}{\eta V_T}}-1\right)$$

(B)

$$I_0 e^{-\frac{V}{\eta V_T}}$$

(C)

$$I_0\left(e^{-\frac{V}{\eta V_T}}+1\right)$$

(D) I

---

40. The maximum time for the diode to switch from ON to OFF is called

(A) Rise time

(B) Fall time

(C) Saturation time

(D) Reverse recovery time

---

41. Find the value of emitter current for a transistor with

$$\alpha_{dc} = 0.98$$

and

$$I_{CBO} = 5\ \mu A$$

when the base current is measured as

$$100\ \mu A.$$

(A) 5.25 mA

(B) 5.15 mA

(C) 4.9 mA

(D) 0.25 mA

---

42. The region of the V-I characteristic of JFET where I_D (drain current) is fairly constant is referred as

(A) Cut-off

(B) Pinch-off

(C) Active

(D) Saturation

---

43. For enhancement MOSFET, the gate-source voltage must have

(A) Positive

(B) Negative

(C) Same polarity as the drain supply

(D) Opposite polarity as the drain supply

---

44. The incorrect statement with respect to thin-film integrated circuits is

(A) Depositing film of conducting material on the surface of a glass

(B) Silk-screen printing techniques are employed to create the desired circuit pattern

(C) Capacitors are produced by sandwiching a film of insulating oxide between two conducting films

(D) Inductors are made by depositing a spiral formation of film

---

45. In discrete transistors the substrate is normally used as

(A) Emitter

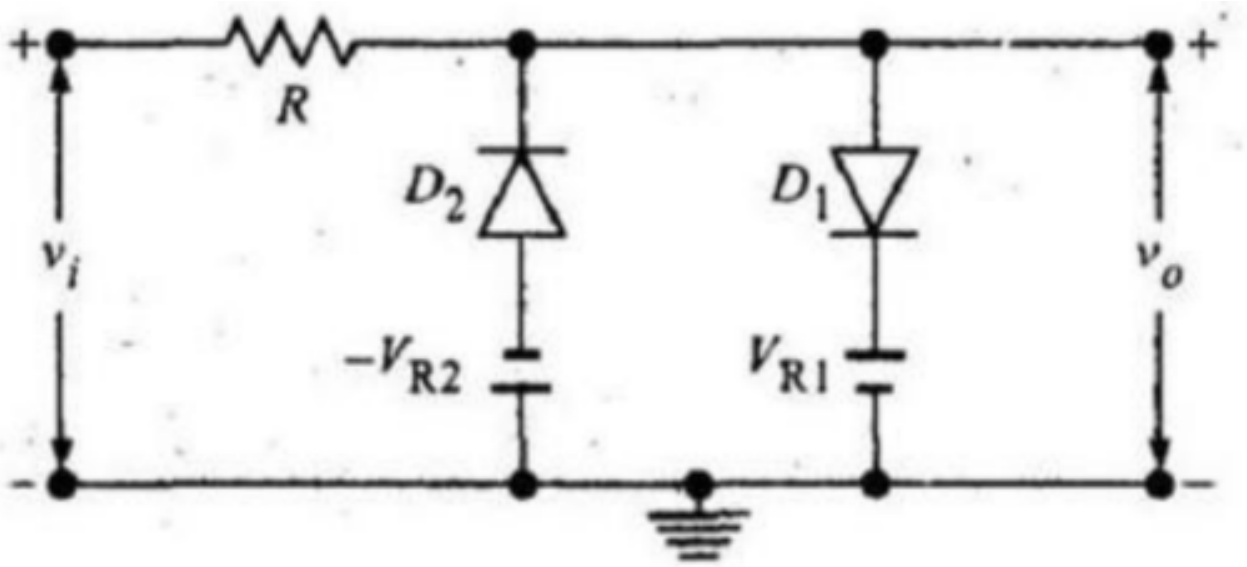
(B) Collector

(C) Base

(D) Bias supply

---

46. Which of the following is correct with reference to the given diode limiter circuit?



(A)

$$-V_{R2} < v_i < V_{R1} \Rightarrow D_1 \text{ OFF}, D_2 \text{ ON} \Rightarrow v_o = V_{R1}$$

(B)

$$v_i < V_{R1} \Rightarrow D_1 \text{ ON}, \ D_2 \text{ OFF} \Rightarrow v_o = V_{R1}$$

(C)

$$v_i < V_{R2} \Rightarrow D_1 \text{ OFF}, \ D_2 \text{ OFF} \Rightarrow v_o = v_i$$

(D)

$$-V_{R2} > v_i \Rightarrow D_1 \text{ OFF}, \ D_2 \text{ ON} \Rightarrow v_o = -V_{R2}$$

---

47. In Emitter current bias, if

$$R_1 || R_2$$

is very much larger than

$$R_E,$$

then the circuit performance becomes like

(A) Remains in the same bias circuit

(B) Fixed current bias circuit

(C) Collector to base bias circuit

(D) Voltage divider bias circuit

---

48. Match the following:

A	Small signal amplifier	I	Amplify steady-state input voltage
B	DC amplifier	II	Large signal amplifier
C	Operational amplifier	III	Pre-amplifier
D	Power amplifier	IV	IC amplifiers

(A) $A-II, B-IV, C-I, D-III$

(B) $A-IV, B-III, C-II, D-I$

(C) $A-III, B-I, C-IV, D-II$

(D) $A-I, B-II, C-III, D-IV$

---

49. The non-inverting amplifier circuit behaves very similar to the voltage follower circuit except that

(A) Only a portion of output is fed back

(B) High input impedance

(C) Low output impedance

(D) Very little voltage drop across R_1

---

50. Class AB operation is often used in power amplifiers in order to

(A) Overcome a cross over distortion

(B) Decrease distortion

(C) Increase distortion

(D) Introduce non-linearity

---

51. Calculate the circuit output resistance in the common drain amplifier with

$$r_d = 100\ k\Omega, \qquad g_m = 990\ \mu S$$

and

$$R_L = 10\ k\Omega.$$

(A) 322 Ω

(B) 332 Ω

(C) 990 Ω

(D) 10 $k\Omega$

---

52. Under steady-state conditions, the clamping theorem states that

(A)

$$\frac{A_f}{A_r} = \frac{R_f}{R}$$

(B)

$$\frac{A_r}{A_f} = \frac{R_f}{R}$$

(C)

$$\frac{A_f}{A_r} = \frac{R}{R_f}$$

(D)

$$\frac{A_f}{A_r} = 1$$

---

53. The correct option with respect to IC 723 general purpose regulator is

(A) Inherently low currents

(B) Have in-built thermal protection

(C) No short circuit current limits

(D) Wide range of both positive or negative regulator voltage

---

54. In IC 555 timer, three $5k\Omega$ internal resistors act as voltage divider, which provides bias voltage to the upper comparator and to the lower comparator in the order of (in V_{CC}).

(A)

$$\frac{2}{3}, \frac{1}{3}$$

(B)

$$\frac{1}{3}, \frac{1}{3}$$

(C)

$$\frac{1}{3}, \frac{2}{3}$$

(D)

$$\frac{2}{5}, \frac{1}{5}$$

---

55. The collector of the leading transistor connected to the emitter of the following transistor configuration is called

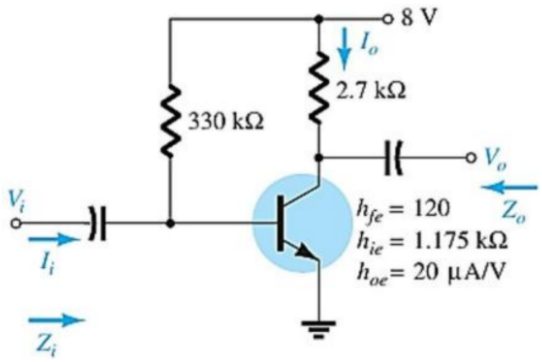
(A) Emitter follower amplifier

(B) Common emitter amplifier

(C) Cascade amplifier

(D) Cascode amplifier

56. A_I **in the given circuit is**



(A) 50

(B) 100

(C) 120

(D) 121

---

57. The maximum efficiency of a class A series-fed amplifier is

(A) 25%

(B) 50%

(C) 78.5%

(D) 82.3%

---

58. The required current gain in a transistor phase-shift oscillator is

(A)

$$h_{fe} > 29 + 23\frac{R_C}{R} + 4\frac{R}{R_C}$$

(B)

$$h_{fe} < 29 + 23\frac{R_C}{R} + 4\frac{R}{R_C}$$

(C)

$$h_{fe} > 23 + 29\frac{R}{R_C} + 4\frac{R_C}{R}$$

(D)

$$h_{fe} < 23 + 29\frac{R}{R_C} + 4\frac{R_C}{R}$$

59. A dc voltage supply provides $60V$ when the output is unloaded. When connected to a load, the output drops to $56V$. Determine the value of voltage regulation.

(A) 4.5%

(B) 7.1%

(C) 14%

(D) 15%

---

60. If an amplifier with gain of -1000 and feedback of

$$\beta = -0.1$$

has a gain change of 20% due to temperature, calculate the change in gain of the feedback amplifier.

(A) 0.2%

(B) 0.1%

(C) 0.001%

(D) 0.0001%

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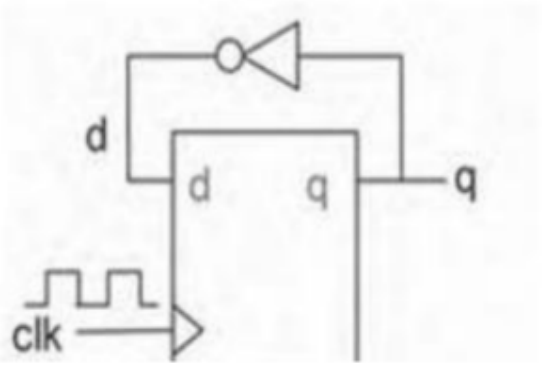
61. The following circuit works like a



(A) D Flip-flop

(B) T Flip-flop

(C) Frequency divider

(D) Inverter

62. The SRAM from a memory-read perspective, is indeed a combinational circuit because

(A) Its next state depends on its present state

(B) A data retrieval is not affected by previous data retrievals

(C) It is storage element

(D) It operates in sequential fashion

---

63. The BCD code of decimal number 255 is

(A) 0010 0101 0101

(B) 1111 1111 1110

(C) 1111 1111 1111

(D) 0111 1111 1111

---

64. Using 8-bit numbers, find the 2's complement of -128.

(A) 01111111

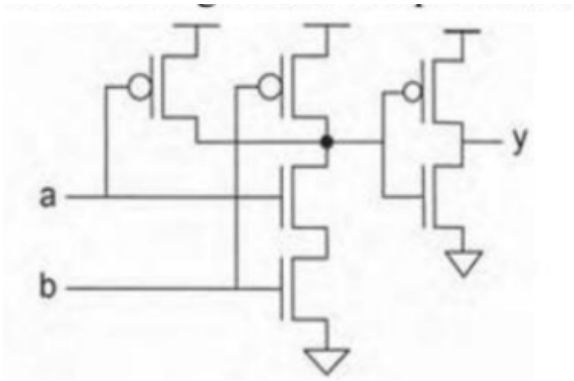
(B) 11000111

(C) 10000001

(D) 10000000

---

65. The following circuit is equivalent of



(A) AND Gate

(B) OR Gate

(C) NOR Gate

(D) NAND Gate

---

66. Modulo-2 adder (without carry-out) works like

(A) OR gate

(B) XOR gate

(C) XNOR gate

(D) XNAND gate

---

67. The logical equation of tri-state buffer is

($E =$ **enable**, $Z =$ **high impedance**)

(A)

$$Y = E'Z + EX$$

(B)

$$Y = E'Z' + EX'$$

(C)

$$Y = Z' + EX$$

(D)

$$Y = EZ + X$$

---

68. The modulo 2^N counter consist of the following number of states and flip-flops respectively

(A) $2N - 1$ and $N - 1$

(B) 2^{2N} and $N - 1$

(C) 2^{N-1} and $N - 1$

(D) 2^N and N

---

69. Simplify the Boolean expression

$$ab' + bc + ac$$

(A) $ab' + bc$

(B) $ab' + ac$

(C) $bc + ac$

(D) $a + b + c$

---

70. PAL devices composed of

(A) Fixed array of AND gates followed by a fixed array of OR gates

(B) Programmable AND and OR gate arrays

(C) Fixed array of AND gates followed by a programmable array of OR gates

(D) Programmable array of AND gates followed by a fixed array of OR gates

---

71. Calculate the full scale output value of an 8-bit DAC for the 0 to 10 V range?

(A) 0.039 V

(B) 5 V

(C) 9.961 V

(D) 10 V

---

72. If the converter of Dual-slope ADC first integrates the analog input signal for a fixed duration, then the clock periods are

(A) n

(B) $n-1$

(C) 2^n

(D) 2^{n-1}

---

73. TRAP is addressed by

(A) $0016H$

(B) $0024H$

(C) $0033H$

(D) $0034H$

---

74. When the following is used, the CPU is bypassed for certain data transfers?

(A) Polled I/O

(B) DMA

(C) TRAP

(D) Software Interrupts

---

75. In 8086 microprocessor, the instruction used to copy the word from the top of the stack to the flag register is

(A) PUSH

(B) PUSHF

(C) POP

(D) POPF

---

76. The damped natural frequency of an underdamped system is given by

(A) ω_n

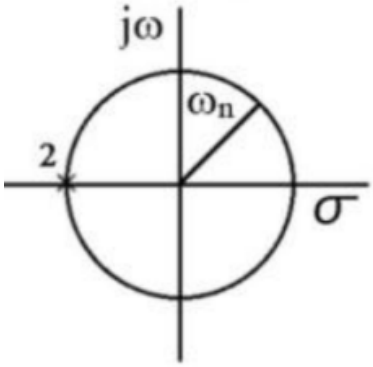
(B) $\omega_n \zeta^2$

(C) $\omega_n \sqrt{1+\zeta^2}$

(D) $\omega_n \sqrt{1-\zeta^2}$

---

77. The following plot shows



(A) Critical damped system

(B) Under damped system

(C) Over damped system

(D) Undamped system

---

78. The range of steady state value for the rise time of underdamped system is

(A) 0 to 90%

(B) 10 to 90%

(C) 0 to 100%

(D) 10 to 100%

---

79. $\lim_{s\to 0} s^2 G(s)$ **defines**

(A) Positional error constant

(B) Velocity error coefficient

(C) Acceleration error constant

(D) Mean square error coefficient

---

80. The steady state error for a type 1 system with input of

$$\frac{At^2}{2}u(t)$$

is

(A) 0

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

(C) 1

(D) ∞

---

81. The control system with single pole at origin is

(A) Unstable

(B) Stable

(C) Marginally stable

(D) Absolutely stable

---

82. For the system

$$G(s)H(s) = \frac{K(s+a^2)}{(s+b)^2},$$

the break point is

(A) a, b

(B) $-a, -b$

(C) $\sqrt{ab}$

(D) $-b \pm \sqrt{b^2 - ab}$

---

83. The incorrect option for a Closed loop control system output is

(A) Decrease the effect of noise

(B) Improves the overall stability

(C) Sensitivity is reduced

(D) Independent of variation in feedback parameter

---

84. The characteristic polynomial of a system is

$$s^3 + 2s^2 + 4s + K.$$

The system is marginally stable for

(A) $K = 0$

(B) $K = 8$

(C) $0 < K < 4$

(D) $0 < K < 8$

---

85. The root locus approaches straight lines as asymptotes approaches

(A) Zero

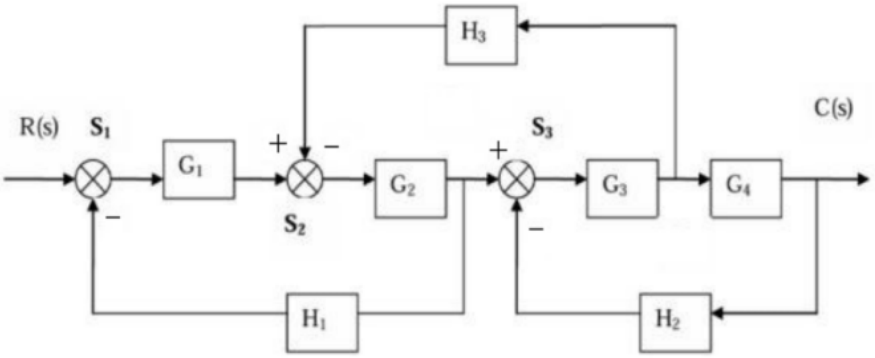
(B) Unity

(C) Infinity

(D) $j\omega$ axis

---

86. Determine the transfer function $\frac{C(s)}{R(s)}$ of the system shown below.



(A)

$$\frac{G_1G_2G_3G_4}{(1+G_1G_2H_1)(1+G_3G_4H_2)+G_2G_3H_3}$$

(B)

$$\frac{G_1G_4}{(1+G_1G_2H_1H_2)+(1+G_2G_3G_4H_3)}$$

(C)

$$\frac{G_1G_3G_4}{(1+G_1G_2H_1)(1+G_3G_4)+(1+G_2G_3H_2)}$$

(D)

$$\frac{G_1G_2G_3}{(1+G_1G_2H_1)(1+G_3G_4)+(G_2G_3H_3+G_4)}$$

---

87. For the following Routh's array, the system is

s^3	1	0
s^2	2	9
s^1	−4.5	
s^0	9	

(A) Unstable

(B) Stable

(C) Marginally stable

(D) Conditionally stable

---

88. Error constants of a system are measure of

(A) Relative stability

(B) Transient state response

(C) Steady state response

(D) Marginal stability

---

89. The following are the effects of a phase-lead compensation except

(A) Crossover frequency is increased

(B) Rise time is increased

(C) Settling time is reduced

(D) More damping

---

90. The incorrect statement with respect to Bode Plots is

(A) Gain margin and phase margin both are positive then system is stable

(B) Gain margin is measured above the $0\,dB$ axis, then system is unstable

(C) If the phase margin is measured below the $-180°$ axis, the system is stable

(D) Absolute and relative stability of only minimum-phase system can be determined

---

91. The total power in the two side-frequencies of the resulting AM is one third of the total power in the modulated wave when the modulation index is

(A) 25%

(B) 33%

(C) $> 100\%$

(D) 66%

---

92. The quadrature null effect of the coherent detector occur at

(A) $\phi = 0$

(B) $\phi = \pm\frac{\pi}{2}$

(C) $\phi = \pm\pi$

(D) $\phi = 2\pi$

---

93. To develop the time-domain description of SSB modulation, the required mathematical tool is known as

(A) Fourier transform

(B) Hilbert transform

(C) Discrete Cosine transform

(D) Sine transform

---

94. In the transmission of television signals in practice, a controlled amount of carrier is added to the VSB modulated signal. This is done to use

(A) An envelope detector for demodulation

(B) A square wave detector for demodulation

(C) A square wave detector for modulation

(D) A product modulation for modulation

---

95. Prior to sampling, the type of filter used to attenuate high frequency components of the signal that lie outside the band of interest is

(A) Lowpass aliasing

(B) Highpass aliasing

(C) Lowpass anti-aliasing

(D) Highpass anti-aliasing

---

96. Which of the following is used to correct the aperture effect due to flat-top sampling in the sample-and-hold circuit of PAM demodulation?

(A) Amplifier

(B) Low pass filter

(C) Band pass filter

(D) Equalizer

---

97. A FDM system is used to multiplex 24 independent voice signals. SSB modulation is used for the transmission. Given that each voice signal is allotted a bandwidth of 4 kHz, calculate the overall transmission bandwidth of the channel?

(A) 6 kHz

(B) 8 kHz

(C) 96 kHz

(D) 192 kHz

---

98. A TDM system is used to multiplex four independent voice signals each sampled at the rate of 8 kHz using PAM. The system incorporates a synchronizing pulse train for its proper operation. Calculate the transmission bandwidth?

(A) 8 kHz

(B) 16 kHz

(C) 32 kHz

(D) 40 kHz

---

99. What are the conditions for distortion less transmission through a system?

(A) Gain is linear and phase is constant

(B) Gain and phase should be linear

(C) Gain and phase must be constant

(D) Gain must be constant and phase should be linear

---

100. A random process is stationary

(A) If all statistical properties do not change with time

(B) If the future values of any sample function can be predicted from present values only

(C) Future values cannot be predicted

(D) If the future values of any sample function can be predicted from past values only

---

101. The random process $X(t) = A\cos(\omega_0 t + \theta)$ is wide-sense stationary, where A and ω_0 are constants and θ is a uniformly distributed random variable on the interval $(0, 2\pi)$. Then the mean value is

(A) > 0

(B) 1

(C) π

(D) 0

---

102. The following are properties of auto correlation except

(A) $|R_{XX}(\tau)| \leq R_{XX}(0)$

(B) $|R_{XX}(-\tau)| = R_{XX}(\tau)$

(C) $|R_{XX}(\tau)| = E[x(t)]$

(D) If $x(t)$ has a periodic component, then $R_{XX}(\tau)$ will have a periodic component with the same period

---

103. A receiver connected to an antenna whose resistance is $50\ \Omega$ has an equivalent noise resistance of $30\ \Omega$. Calculate the receiver's noise figure?

(A) 0.6

(B) 1.0

(C) 1.6

(D) 2.0

---

104. Which of the following is not correct if the intermediate frequency is too high?

(A) Poor selectivity

(B) Poor adjacent channel rejection

(C) Increase tracking difficulties

(D) Poor image frequency rejection

---

105. The problem of reducing the gain of receiver for weak signals is avoided by

(A) No AGC

(B) Ideal AGC

(C) Simple AGC

(D) Delayed AGC

---

106. In communication receivers, the filter used to reduce receiver gain at some specific frequency is

(A) Low pass

(B) High pass

(C) Band pass

(D) Notch

---

107. The Foster-Seeley discriminator along with amplitude limiter is called

(A) Envelope detector

(B) Ratio detector

(C) Balanced modulator

(D) Square-law modulator

---

108. A four level PAM has a input data rate of 2400 $bits/s$ **then the symbol rate is**

(A) 600 $symbols/s$

(B) 1200 $symbols/s$

(C) 2400 $symbols/s$

(D) 9600 $symbols/s$

---

109. Match the following: A: ASK, B: APK, C: PSK, D: FSK

(A) A-IV, B-I, C-II, D-III

(B) A-III, B-II, C-I, D-IV

(C) A-II, B-III, C-IV, D-I

(D) A-I, B-IV, C-III, D-II

---

110. If the rows of channel matrix are all equal to each other, then the channel capacity is

(A) 0

(B) 1

(C) ∞

(D) Equal to bandwidth of channel

---

111. The Gauss's law for magnetic fields is

(A) $\nabla \cdot E = 0$

(B) $\nabla \cdot H = 0$

(C) $\nabla \cdot B = 0$

(D) $\nabla \cdot D = 0$

---

112. Identify the polarisation of the wave given, $E_x = 2\cos\omega t$, $E_y = 2\sin\omega t$ and the phase difference is $+90^\circ$

(A) Left hand circularly polarized

(B) Right hand circularly polarized

(C) Left hand elliptically polarized

(D) Right hand elliptically polarized

---

113. The characteristic impedance of the medium is

(A) 120π

(B) $120\pi\left(\frac{\mu_r}{\epsilon_r}\right)$

(C) $\mu_r\epsilon_r$

(D) ϵ_r

---

114. The depth of penetration decreases, if

(A) Conductivity decreases

(B) Relative permeability decreases

(C) Frequency increases

(D) Phase velocity decreases

115. Snell's law states that (n_1 is the index of refraction of the first medium and n_2 is that of second, θ_t is the angle of refraction and θ_i is angle of incidence)

(A) $n_1 \sin\theta_i = 0$

(B) $n_2 \sin\theta_t = 0$

(C) $n_2 \sin\theta_t = n_1 \sin\theta_i$

(D) $n_2 \sin\theta_t = -n_1 \sin\theta_i$

---

116. For a lossy transmission line, the characteristic impedance does not depend on

(A) Operating frequency of the line

(B) Length of the line

(C) Conductivity of the conductors

(D) Conductivity of the dielectric separating the conductors

---

117. A rectangular waveguide with dimensions $a = 2.5$ cm, $b = 1$ cm is operating below 15 GHz. If the guide is filled with a medium characterized by $\sigma = 0$, $\epsilon = 4\epsilon_0$, $\mu_r = 1$, calculate the cutoff frequency of dominant mode?

(A) 3 GHz

(B) 9 GHz

(C) 12 GHz

(D) 15 GHz

---

118. Find the maximum gain of a $\frac{\lambda}{2}$ wire dipole operating at 30 MHz?

(A) 1

(B) 1.64

(C) 10.23

(D) 30.33

---

119. The S-parameters are used at microwave frequencies because of the following reasons, except

(A) Equipment is readily available to measure total voltage and total current

(B) Short and open circuits are difficult to achieve over a broad band of frequencies

(C) Logical variables to use at the microwave frequencies are travelling waves

(D) More stable Active devices are used at short or open circuits

---

120. The fraction of time that the transmitter is transmitting during one radar cycle is called

(A) Pulse Repeating Frequency

(B) Pulse Repetition Interval

(C) Pulses Per Second

(D) Duty Factor
