

PUNJAB PUBLIC SERVICE COMMISSION

Objective Type Test (Aug-2017) for Recruitment of Lecturer Electronics and Communication Engineering in the Department of Technical Education & Industrial Training, Government of Punjab.

READ INSTRUCTIONS BEFORE FILLING ANY DETAILS OR ATTEMPTING TO ANSWER THE QUESTIONS.

Candidate's Name _____

Father's Name _____

Date of Birth **Category Code***

DD MM YYYY (*as given in the admit card)

OMR Response Sheet No. _____

Roll No. _____

Candidate's Signature (Please sign in the box)

Question Booklet Set

A

Booklet Series No.

INSTRUCTIONS

<p>1. The candidate shall NOT open this booklet till the time told to do so by the Invigilation Staff. However, in the meantime, the candidate can read these instructions carefully and subsequently fill the appropriate columns given above in CAPITAL letters. The candidate may also fill the relevant columns (other than the columns related to marking responses to the questions) of the Optical Mark Reader (OMR) response sheet, supplied separately.</p>	<p>9. The candidates shall ensure that the responses are marked in correct manner and any adverse impact due to wrong marking of responses would be the responsibility of the respective candidate. The following are some of the examples of wrong marking of responses on the OMR response sheet.</p> <div style="text-align: center; margin: 5px 0;"> </div>
<p>2. Use only blue or black ball point pen to fill the relevant columns on this page. Use of fountain pen may leave smudges which may make the information given by the candidate here illegible.</p> <p>3. The candidate shall be liable for any adverse effect if the information given above is wrong or illegible.</p>	<p>10. The candidates, when allowed to open the question paper booklet, must check the booklet to confirm that the booklet has complete number of pages, the pages printed correctly and there are no blank pages. In case there is any such error in the question paper booklet then the candidate should immediately bring this fact to the notice of the invigilation Staff and obtain a booklet of the same series as given earlier.</p>
<p>4. Before attempting the paper, the candidate must fill all the columns given above on this page and sign at the appropriate place.</p> <p>5. Each candidate is required to attempt 100 questions in 120 minutes, except for orthopaedically/visually impaired candidates, who would be given 40 extra minutes, by marking correct responses on the OMR sheet which would be supplied separately to the candidates.</p>	<p>11. The serial number of the new booklet should be entered in the relevant column of the OMR. The Invigilation Staff must make necessary corrections in their record regarding the change in the serial no. of question booklet.</p>
<p>6. The candidate must write the following on the OMRs sheet: (a) Serial number of OMR sheet supplied to him/her for marking the responses to the questions. (b) Serial number of the question booklet (c) Series of the question booklet. Failure to do so may lead to cancellation of candidature or any other action which the Commission may deem fit.</p>	<p>12. The question paper booklet has 19 pages.</p> <p>13. Each question shall carry three marks.</p>
<p>7. The candidate should darken the appropriate response to the question by completely darkening the appropriate circle/oval according to his/her choice of response i.e. a, b, c or d in the manner shown in the example below.</p> <div style="text-align: center; margin: 5px 0;"> a b c d </div>	<p>14. There are four options for each question and the candidate has to mark the MOST APPROPRIATE answer on the OMR response sheet using blue or black ball point pen.</p>
<p>8. Partly darkening the circle/oval on the OMR response sheet or using other symbols such as tick mark or cross would not result in evaluation of the response as the OMR scanner can only interpret the answers by reading the darkened responses in the manner explained in preceding paragraph. Darkening more than one circle/oval as response to a question shall also be considered as wrong answer.</p>	<p>15. There is no negative marking for wrong answers or questions not attempted by the candidate.</p>

1. When was the Khalsa Panth established?
 - (a) 1615
 - (b) 1688
 - (c) 1699
 - (d) 1700

2. Match the following:

A. Punjab Kesari	1. Bal Gangadhar Tilak
B. Maratha	2. Lala Jagat Narain
C. Anandamath	3. Rabindranath Tagore
D. Gora	4. Bankim Chandra Chatterjee

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

3. Diffusion of light in the atmosphere takes place due to
 - (a) Oxygen
 - (b) Dust particles
 - (c) Carbon dioxide
 - (d) Nitrogen

4. According to the Census of India 2011 which state has the least number of females for every 1000 males?
 - (a) Punjab
 - (b) Haryana
 - (c) Jammu& Kashmir
 - (d) Sikkim

5. Progressive taxation is closely associated with
 - (a) The Benefit Principle
 - (b) The Ability to Pay approach
 - (c) The Concentration effect
 - (d) None of the above

6. Who is the supreme commander of the Armed Forces in India?
 - (a) President
 - (b) Prime Minister
 - (c) Defence Minister
 - (d) Chief Justice of Supreme Court

7. The three elements needed for healthy growth of plants are
 - (a) N, P, K
 - (b) N, S, O
 - (c) P, O, C
 - (d) N, P, C

8. Which greenhouse gas was not present in the environment in the pre-industrial times (Before 1750)?
- (a) Trichlorofluoromethane
 - (b) Carbon Dioxide
 - (c) Nitrous Oxide
 - (d) Methane
9. Who founded the Arya Samaj?
- (a) Bal Gangadhar Tilak
 - (b) Swami Dayanand
 - (c) Swami Shradhdhanand
 - (d) Swami Vivekanand
10. India has not signed the CTBT. What does it stand for?
- (a) Comprehensive Treaty on Biological Testing
 - (b) Comprehensive Nuclear-Test Ban Treaty
 - (c) Cooperative Nuclear-Test Ban Treaty
 - (d) Cohesive Treaty on Biological Testing
11. The gas usually filled in CFL Bulbs is
- (a) Nitrogen
 - (b) Helium
 - (c) Argon
 - (d) Xenon
12. Which element is essential for transmission of nerve impulses in human body?
- (a) Sodium
 - (b) Calcium
 - (c) Iron
 - (d) Potassium
13. The largest site of Indus Valley Civilization excavated till date is
- (a) Lothal
 - (b) Chanhudaro
 - (c) Dholavira
 - (d) Mohenjodaro
14. The Sangam Period refers to the historical period in
- (a) Northwestern India
 - (b) Gangetic Plains
 - (c) Eastern India
 - (d) Southern India
15. Devaluation of currency leads to
- (a) fall in domestic prices
 - (b) increase in domestic prices
 - (c) no impact on domestic prices
 - (d) erratic fluctuations in domestic prices

16. Agriculture including agricultural education and research is in which list of Indian Constitution?
- (a) Union list
 - (b) State list
 - (c) Concurrent List
 - (d) None of the above
17. Who among the following was the Chairman of the Drafting Committee of the Indian Constitution?
- (a) Pt. Jawaharlal Nehru
 - (b) Sachidananda Sinha
 - (c) B.R. Ambedkar
 - (d) Dr. Rajendra Prasad
18. Which one of the following comes under the jurisdiction of both the High Court and the Supreme Court?
- (a) Disputes between the Centre and the States
 - (b) Disputes between the States inter se
 - (c) Protection of the Fundamental Rights
 - (d) Protection against the violation of the Constitution
19. The National Song of India was composed by
- (a) Rabindranath Tagore
 - (b) Bankim Chandra Chatterji
 - (c) Iqbal
 - (d) Jai Shankar Prasad
20. Ministry of Health's 'Mission Parivar Vikas' is aimed at:
- (a) achieving India's population control target faster
 - (b) achieving higher sex ratio in Haryana and Punjab
 - (c) promoting balanced diet usage to check malnutrition
 - (d) promoting menstrual hygiene among adolescent girls
21. Recently the Punjab Government announced September 12 to be observed as:
- (a) Sadbhavna Diwas
 - (b) Punjab Day
 - (c) Maa-Boli Diwas
 - (d) Saragarhi Day
22. Who among the following is the architect of Public Interest Litigation (PIL) in India?
- (a) P N Bhagwati
 - (b) J S Khehar
 - (c) Subramaniam Swamy
 - (d) V.R. Krishna Iyer

23. Which city of Punjab is famous for furniture goods?

- (a) Kiratpur
- (b) Mansa
- (c) Kartarpur
- (d) Khanna

24. Which one of the following is the banker of the banks?

- (a) State Bank of India
- (b) Reserve Bank of India
- (c) Punjab National Bank
- (d) Central Bank of India

25. Match the following:

	Disease	Affected organ
1.	Tetanus	A. Nervous system
2.	Cholera	B. Lungs
3.	Tuberculosis	C. Intestine

Code:

- | | A | B | C |
|-----|---|---|---|
| (a) | 3 | 1 | 2 |
| (b) | 1 | 3 | 2 |
| (c) | 3 | 2 | 1 |
| (d) | 2 | 3 | 1 |

26. Three of the following four are alike in a certain way and so form a group. Which is the one that does not belong to that group?

- (a) Sweet
- (b) Cake
- (c) Pastry
- (d) Biscuit

27. What should come next in the following letter series?

Z X V T R P N L J Y W U S Q O

- (a) M
- (b) K
- (c) N
- (d) J

28. How many meaningful English words can be formed with the letters MASTE using each letter only once in each word?

- (a) None
- (b) One
- (c) Two
- (d) Three

29. The income of Anil, Firoz and Ketan are in the ratio 7 : 9 : 12 and their spending are in the ratio 8 : 9 : 15. If Anil saves $\frac{1}{4}$ of his income, then the saving of Anil, Firoz and Ketan are in the ratio:

- (a) 59 : 99 : 69
- (b) 56 : 99 : 69
- (c) 56 : 96 : 69
- (d) None of these

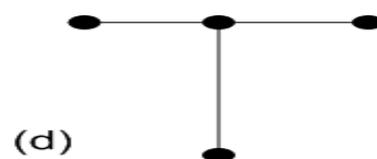
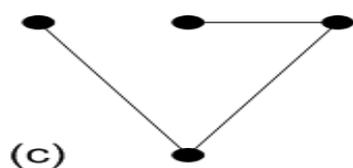
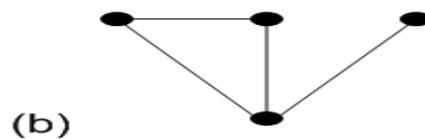
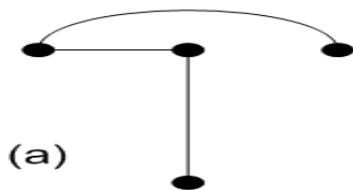
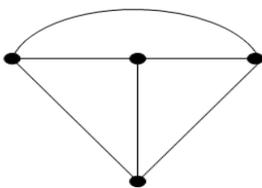
30. Which among the following rivers does not form delta?

- (a) Cauvery
- (b) Luni
- (c) Mahanadi
- (d) Godavari

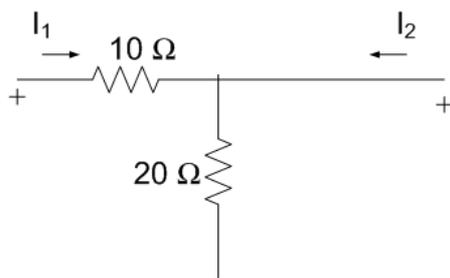
31. A source of angular frequency 1 rad/sec has a source impedance consisting of 1Ω resistance in series with 1 H inductance. The load that will obtain the maximum power transfer is:

- (a) 1Ω resistance in series with 1 F capacitor
- (b) 1Ω resistance in parallel with 1 H inductance
- (c) 1Ω resistance in parallel with 1 F capacitor
- (d) 1Ω resistance

32. Consider the network graph shown in the figure. Which one of the following is not a 'tree' of this graph?



33. The h parameters of the circuit shown in the figure are



(a) $\begin{bmatrix} 0.1 & 0.1 \\ -0.1 & 0.3 \end{bmatrix}$

(b) $\begin{bmatrix} 10 & 1 \\ -1 & 0.05 \end{bmatrix}$

(c) $\begin{bmatrix} 30 & 20 \\ 20 & 20 \end{bmatrix}$

(d) $\begin{bmatrix} 10 & -1 \\ 1 & 0.05 \end{bmatrix}$

34. The following cannot be used to remove the unwanted sideband in the SSB:

- (a) A filter system
- (b) Balanced modulator
- (c) Phase shift method
- (d) Weaver's method

35. Channel capacity is basically a measure of:

- (a) maximum rate of information
- (b) Amount of information a channel can take
- (c) Entropy rate
- (d) None of these

36. The gain margin for the system with open loop transfer function

$$G(s)H(s) = \frac{2(1+s)}{s^2}$$

- (a) 0
- (b) 1
- (c) ∞
- (d) $-\infty$

37. The frequency response of a linear, time-invariant system is given by $H(f) = \frac{2}{1+j4\pi f}$. The

step response of the system is

- (a) $2(1-e^{-2t}) u(t)$
- (b) $2(1-e^{-t/2}) u(t)$
- (c) $0.5(1-e^{-2t}) u(t)$
- (d) $0.5(1-e^{-t/2}) u(t)$

38. The z-transform $X(z)$ of a sequence $x[n]$ is given by $X[z]=\frac{5}{1-2z^{-1}}$. It is given that the region of convergence of $X(z)$ includes the unit circle. The value of $x[0]$ is

- (a) -5
- (b) 0
- (c) 0.5
- (d) 5

39. The impulse response $h(t)$ of a linear time invariant continuous time system is described by $h(t)=\exp(\alpha t)u(t)+\exp(\beta t)u(-t)$ where $u(-t)$ denotes the unit step function, and α and β are real constants. This system is stable if

- (a) α is positive and β is positive
- (b) α is negative and β is positive
- (c) α is negative and β is negative
- (d) α is positive and β is negative

40. A sequence $x(n)$ with the z-transform $X(z)=z^4+z^2-2z+2-3z^{-4}$ is applied as an input to a linear, time-invariant system with the impulse $h(n) = 2\delta(n-3)$ where

$$\delta(n) = \begin{cases} 1, & n = 0 \\ 0, & \text{otherwise} \end{cases}$$

The output at $n=4$ is

- (a) -6
- (b) 2
- (c) -4
- (d) 0

41. Consider the following statements S_1 and S_2

S_1 : The β of a bipolar transistor reduces if the base width is increased.

S_2 :The β of a bipolar transistor increases if the doping concentration in the base is increased.

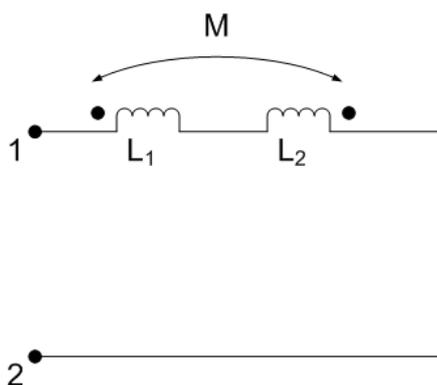
Which one of the following is correct

- (a) S_1 is FALSE and S_2 is TRUE
- (b) S_1 is TRUE and S_2 is TRUE
- (c) S_1 is FALSE and S_2 is FALSE
- (d) S_1 is TRUE and S_2 is FLASE

42. In an abrupt p-n junction, the doping concentration on p-side and n-side are $N_A= 9\times 10^{16} / \text{cm}^3$ and $N_D = 1\times 10^{16} / \text{cm}^3$ respectively. The p-n junction is reverse biased and the total depletion width is $3\mu\text{m}$. The depletion width on p-side is

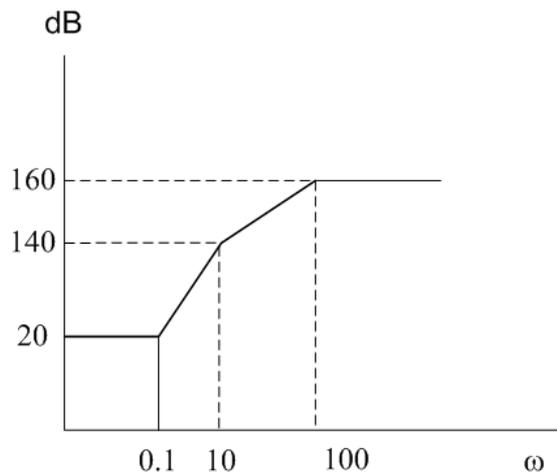
- (a) $2.7\mu\text{m}$
- (b) $0.3\mu\text{m}$
- (c) $2.25\mu\text{m}$
- (d) $0.75\mu\text{m}$

43. To obtain very high input and output impedances in a feedback amplifier, the topology used is
- Voltage series
 - Current series
 - Voltage shunt
 - Current shunt
44. Precautions are essential for ensuring that the secondary of a current transformer (CT) is not open circuited when the primary circuit carries a current because
- Dangerously high voltage might develop across the secondary
 - The ferromagnetic core may develop residual magnetism
 - The reflected impedance may prevent the flow of current in the primary circuit
 - None of the above
45. The effective height of a linear antenna of length 'L' is say 'X' when the current distribution along its length is uniform and, say, it is 'Y' when current distribution is sinusoidal. Then X/Y is equal to
- 2
 - 1
 - $4/\pi$
 - $\pi/4$
46. The equivalent inductance measured between the terminals 1 and 2 for the circuit shown in the figure is



- $L_1 + L_2 - M$
- $L_1 + L_2 + M$
- $L_1 + L_2 - 2M$
- $L_1 + L_2 + 2M$

47. The approximate Bode magnitude plot of a minimum phase system is shown in Fig. below. The transfer function of the system is



- (a) $10^7 \frac{(s+0.1)^3}{(s+10)(s+100)}$
 (b) $10^8 \frac{(s+0.1)^3}{(s+10)^2(s+100)}$
 (c) $\frac{(s+0.1)^2}{(s+10)^2(s+100)}$
 (d) $\frac{(s+0.1)^3}{(s+10)(s+100)^2}$

48. The zero-input response of a system given by the state-space equation

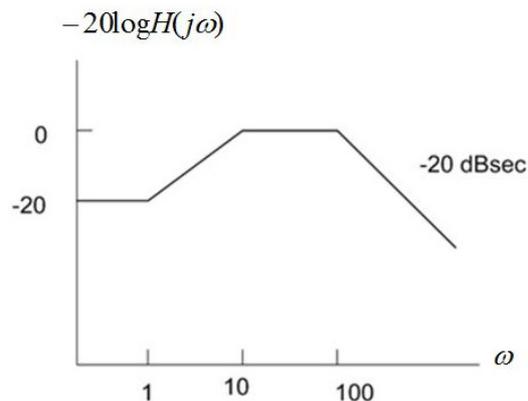
$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \text{ and } \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \text{ is}$$

- (a) $\begin{bmatrix} te^t \\ t \end{bmatrix}$
 (b) $\begin{bmatrix} t \\ te^t \end{bmatrix}$
 (c) $\begin{bmatrix} e^t \\ t \end{bmatrix}$
 (d) $\begin{bmatrix} e^t \\ te^t \end{bmatrix}$

49. Given $G(s)H(s) = \frac{K}{s(s+1)(s+3)}$. The point of intersection of the asymptotes of the root loci with the real axis is

- (a) 1.33
 (b) -1.33
 (c) 4
 (d) -4

50. Consider the Bode magnitude plot shown in the fig. The transfer function $H(s)$ is



- (a) $\frac{(s+10)}{(s+1)(s+100)}$
- (b) $\frac{10(s+1)}{(s+10)(s+100)}$
- (c) $\frac{100(s+1)}{(s+10)(s+100)}$
- (d) $\frac{1000(s+100)}{(s+1)(s+10)}$

51. Let $x(t)$ be the input to a linear, time-invariant system. The required output is $4\pi(t-2)$. The transfer function of the system should be

- (a) $2e^{-j8\pi f}$
- (b) $2e^{j8\pi f}$
- (c) $4e^{j4\pi f}$
- (d) $4e^{-j4\pi f}$

52. An amplifier without feedback has a voltage gain of 50, input resistance of $1\text{k}\Omega$ and output resistance of $2.5\text{k}\Omega$. The input resistance of the current-shunt negative feedback amplifier using the above amplifier with a feedback factor of 0.2 is:

- (a) $\frac{1}{5} \text{ k}\Omega$
- (b) $5 \text{ k}\Omega$
- (c) $\frac{1}{11} \text{ k}\Omega$
- (d) $11 \text{ k}\Omega$

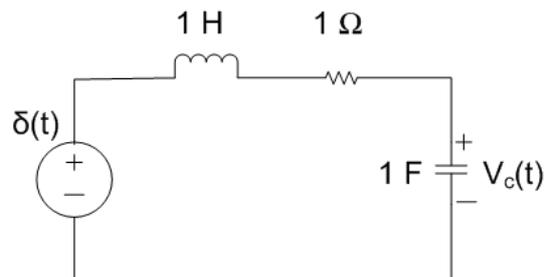
53. A 741-type op-amp has a gain-bandwidth product of 1 MHz. A non-inverting amplifier using this Op-amp and having a voltage gain of 20 dB will exhibit a 3 dB bandwidth of:

- (a) 100 kHz
- (b) 50 kHz
- (c) $\frac{1000}{17} \text{ kHz}$
- (d) $\frac{1000}{7.07} \text{ kHz}$

54. The load impedance Z_L of a common emitter amplifier has R and L in series. The phase difference between output and input will be
- 180°
 - More than 180° but less than 270°
 - 0°
 - More than 90° but less than 180°
55. A 4-bit Modulo-6 ripple counter uses JK flip-flop. If the propagation delay of each flip-flop is 50ns then maximum clock frequency that can be used is:
- 20 MHz
 - 5 MHz
 - 10 GHz
 - 15 MHz
56. The resolution of 4-bit ADC is 0.5 volt, for an analog input of 6.6 volts, the digital output is:
- 1011
 - 1101
 - 1100
 - 1110
57. The switching speed of is lowest
- TTL
 - ECL
 - I^2L
 - CMOS
58. A 10 bit A/D converter is used to digitize an analog signal in the 0 to 5 V range. The maximum peak to peak ripple voltage that can be allowed in the D.C. supply voltage is
- nearly 100 mV
 - nearly 50 mV
 - nearly 25 mV
 - nearly 5.0 mV
59. For $t > 0$, the voltage across the resistor is
- $\frac{2}{\sqrt{3}} e^{-\frac{1}{2}t} \sin \frac{\sqrt{3}}{2} t$
 - $\frac{2}{\sqrt{3}} e^{-\frac{1}{2}t} \cos \frac{\sqrt{3}}{2} t$
 - $\frac{1}{\sqrt{3}} \left(e^{\frac{\sqrt{3}}{2}t} - e^{-\frac{1}{2}t} \right)$
 - $e^{-\frac{1}{2}t} \left[\cos \frac{\sqrt{3}}{2} t - \frac{1}{\sqrt{3}} \sin \frac{\sqrt{3}}{2} t \right]$

60. For parallel RLC circuit, which one of the following statements is not correct?
- At resonance, input impedance is a real quantity
 - At resonance, the magnitude of input impedance attains its minimum values
 - The bandwidth of the circuit decreases if R is increased
 - The bandwidth of the circuit remains same if L is increased
61. A speech signal band-limited to 4 kHz and peak voltage varying between +5V and -5V, is sampled at the Nyquist rate. Each sample is quantized and represented by 8 bits. If the bits 0 and 1 are transmitted using bipolar pulses, the minimum bandwidth required for distortion free transmission is
- 64 kHz
 - 32 kHz
 - 8 kHz
 - 4 kHz
62. The impulse response $h[n]$ of a linear time-invariant system is given by $h[n]=u[n+3]+u[n-2]-2u[n-7]$ where $u[n]$ is the unit step sequence. The above system is
- stable and causal
 - stable but not causal
 - unstable and not causal
 - causal but unstable
63. **Assertion (A):** In a transistor the thickness of the base region is kept as small as possible.
Reason (R): By keeping the base thickness small, a large electric field is produced between the emitter and the collector which makes the transistor fast acting.
- A is true R is true and R is the correct explanation of A
 - A is true R is true and R is not the correct explanation of A
 - A is true but R is false
 - A is false but R is true
64. An amplifier has gain of 800. After adding negative feedback, the gain is measured as 25. The feedback factor is
- 25
 - 0.0412
 - 0.0388
 - 0.01
65. For the boolean expression $\bar{A}BC + A\bar{B}C + AB\bar{C}$, how many 1's are in the output column of the truth table
- 2
 - 3
 - 4
 - 5
66. Minimum number of gates required to implement the boolean expression $XY + X(X + Z) + Y(X + Z)$ after simplification is
- 1
 - 3
 - 2
 - 4

67. The family of logic that is composed of bipolar junction transistors is
- TTL
 - CMOS
 - DIP
 - BJT
68. If A and B are two inputs of the 2-bit adder then it can be used for subtraction by
- Inverting the output
 - Inverting the carry-in
 - Inverting the B input
 - Grounding the B input
69. A cellular system with 25 MHz total bandwidth is allocated for duplex communication. Each simplex channel is 30 KHz. The frequency reuse factor for the system is 7. What is number of channels per cell?
- 59
 - 49
 - 39
 - None
70. The following series RLC circuit with zero initial conditions is excited by a unit impulse function $\delta(t)$.



For $t > 0$, the output voltage $V_c(t)$ is

- $\frac{2}{\sqrt{3}} \left(e^{-\frac{3}{2}t} - e^{-\frac{\sqrt{3}}{2}t} \right)$
 - $\frac{2}{\sqrt{3}} \left(t e^{-\frac{1}{2}t} \right)$
 - $\frac{2}{\sqrt{3}} e^{-\frac{1}{2}t} \left(\sin \frac{\sqrt{3}}{2} t \right)$
 - $\frac{2}{\sqrt{3}} e^{-\frac{1}{2}t} \left(\cos \frac{\sqrt{3}}{2} t \right)$
71. A 230 V rms source supplies power to two loads connected in parallel. The first load draws 10 kW at 0.8 leading power factor and the second one draws 10 kVA at 0.8 lagging power factor. The complex power delivered by the source is
- (18-j1.5) kVA
 - (18+j1.5) kVA
 - (20-j1.5) kVA
 - (20+j1.5) kVA

72. In communication system, the noise due to quantization error is

- (a) non-linear and signal dependent
- (b) linear and signal independent at low frequencies only
- (c) linear and signal dependent
- (d) non-linear and signal independent at low frequencies only

73. A double integrator plant $G(s)=K/s^2$, $H(s)=1$ is to be compensated to achieve the damping ratio $\zeta=0.5$ and an undamped natural frequency, $\omega_n=5$ rad/sec which one of the following compensator $G_e(s)$ will be suitable?

- (a) $\frac{s+3}{s+9.9}$
- (b) $\frac{s+99}{s+3}$
- (c) $\frac{s-6}{s+8.33}$
- (d) $\frac{s+8.33}{s-6}$

74. A linear system is described by the following state equation

$$\dot{X}(t) = AX(t) + BU(t), A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$

The state transition matrix of the system is

- (a) $\begin{bmatrix} \cos t & -\sin t \\ \cos t & \sin t \end{bmatrix}$
- (b) $\begin{bmatrix} \cos t & \sin t \\ -\sin t & \cos t \end{bmatrix}$
- (c) $\begin{bmatrix} -\cos t & \sin t \\ -\sin t & -\cos t \end{bmatrix}$
- (d) $\begin{bmatrix} -\cos t & -\sin t \\ -\sin t & \cos t \end{bmatrix}$

75. The transfer function of a plant is

$$T(s) = \frac{2}{(s + 2.05)(s^2 + s + 1)}$$

The second order approximation of $T(s)$ using dominant pole concept is

- (a) $\frac{1}{(s+2.05)(s+1)}$
- (b) $\frac{2}{(s+2.05)(s+1)}$
- (c) $\frac{2}{(s^2+s+1)}$
- (d) $\frac{1}{(s^2+s+1)}$

76. Consider a linear system whose state space representation is $\dot{x}(t)=Ax(t)$. If the initial state vector of the system is $x(0)=\begin{bmatrix} 1 \\ -2 \end{bmatrix}$, then the system response is $x(t)=\begin{bmatrix} e^{-2t} \\ -2e^{-2t} \end{bmatrix}$. If the initial state vector of the system changes to $x(0)=\begin{bmatrix} 1 \\ -2 \end{bmatrix}$, then the system response becomes $x(t)=\begin{bmatrix} e^{-t} \\ -e^{-t} \end{bmatrix}$. The system matrix is

- (a) $\begin{bmatrix} 0 & 1 \\ -1 & 1 \end{bmatrix}$
- (b) $\begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$
- (c) $\begin{bmatrix} 1 & 1 \\ -1 & 2 \end{bmatrix}$
- (d) $\begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix}$

77. The signal $x(t)$ is described by

$$x(t) = \begin{cases} 1 & \text{for } -1 \leq t \leq +1 \\ 0 & \text{otherwise} \end{cases}$$

Two of the angular frequencies at which its Fourier transform becomes zero are

- (a) $0, \pi$
- (b) $0.5\pi, 1.5\pi$
- (c) $\pi, 2\pi$
- (d) $2\pi, 2.5\pi$

78. Measurement of hall coefficient in a semiconductor provides information about

- (a) sign and mass of charge carriers
- (b) sign of charge carriers alone
- (c) mass and concentration of charge carriers
- (d) sign and concentration of charge carriers

79. Consider the following statements in a Semiconductor crystal

1. As temperature increases lattice scattering increases.
2. Lattice Scattering is directly proportional to Doping levels.
3. As temperature increases mobility due to ionized impurity scattering increases.
4. As doping increases mobility due to ionized scattering decreases because scattering events decreases.

Which of the following statements are correct?

- (a) 1, 2 and 4
- (b) 2 and 4
- (c) 1, 2 and 3
- (d) 1 and 3

80. Match the following

- (i) Hartley (ii) Wein Bridge (iii) Crystal
(p) Low frequency oscillator (q) High frequency oscillator
(r) Stable frequency oscillator (s) Relaxation oscillator (t) Negative resistance oscillator
- (a) i-q, ii-p, iii-r
(b) i-p, ii-q, iii-r
(c) i-r, ii-p, iii-q
(d) i-t, ii-s, iii-p

81. If the differential voltage gain and common mode voltage gain of a differential amplifier are 48dB and 2 dB respectively, then its common mode rejection ratio is

- (a) 24dB
(b) 25dB
(c) 46dB
(d) 50dB

82. For handoff in GSM systems, signal threshold with respect to minimum usable signal should be

- (a) 0 to 6 dB
(b) 6 to 10 dB
(c) 10 to 20 dB
(d) zero

83. For a given frequency, the deflecting torque of an induction ammeter is directly proportional to

- (a) current²
(b) current³
(c) $\sqrt{\text{current}}$
(d) current

84. A rectangular wave guide having TE₁₀ mode as dominant mode is having a cutoff frequency of 18 GHz for the TE₃₀ mode. The inner broad wall dimension of the rectangular wave guide is

- (a) 5/3 cm
(b) 5 cm
(c) 2.5 cm
(d) 10 cm

85. When a plane wave travelling in free space is incident normally on a medium having $\epsilon_r = 4.0$, the fraction of power transmitted into the medium is given by

- (a) 8/9
(b) 1/2
(c) 1/3
(d) 5/6

86. A source is delivering maximum power to a resistance through a network. The ratio of power delivered to the source power

- (a) is always 0.5
(b) may be 0.5 or less or more
(c) may be 0.5 or more
(d) may be 0.5 or less

87. The Fourier transform of a signal $h(t)$ is $H(j\omega) = (2\cos\omega)(\sin 2\omega)/\omega$. The value of $h(0)$ is
- 0
 - 1/2
 - 1
 - 2
88. A linear time-invariant system is having frequency response $(e^{j\omega})$. If a signal $(n) = \sin(\omega_0 n + f)$ is input to the system and obtained output is $y(n) = Ax(n - pn_0)$.
- The most general form of $\angle(e^{j\omega})$ will be
- $-n_0\omega_0 + \beta$ for any arbitrary real β
 - $n_0\omega_0 + 2\pi k$ for any arbitrary integer k
 - $-pn_0\omega_0 + 2\pi k$ for any arbitrary integer k
 - $-n_0\omega_0 + p$ for any arbitrary real p
89. In a p-n junction to make the depletion region extend predominantly into p-region, the concentration of impurities in the p- region must be
- Much less than the concentration of impurities in n-region
 - Much higher than the concentration of impurities in n-region
 - Equal to the concentration of impurities in n-region
 - Zero
90. The majority carriers in an n-type semiconductor have an average drift velocity V in a direction perpendicular to a uniform magnetic field B . The electric field E induced due to Hall effect acts in the direction
- $V \times B$
 - along V
 - $B \times V$
 - opposite to V
91. A potential of 7 V is applied to a silicon diode. A resistance of 1 k Ω is also connected in series. If the diode is forward biased, the current in the circuit is
- 7 mA
 - 6.3 mA
 - 0.7 mA
 - 0
92. An amplifier has two identical cascaded stages. Each stage has bandwidth of 20 kHz. The overall bandwidth is equal to
- 10 kHz
 - 12.9 kHz
 - 20 kHz
 - 28.3 kHz

93. A buffer amplifier should have

- (a) high output impedance and high input impedance
- (b) high output impedance and low input impedance
- (c) low output impedance and low input impedance
- (d) low output impedance and high input impedance

94. The large signal bandwidth of an OPAMP is limited by its

- (a) unity gain crossover frequency specification
- (b) slew rate specification
- (c) CMRR specification
- (d) open loop gain

95. A Darlington emitter follower circuit is sometimes used in the output of TTL gate

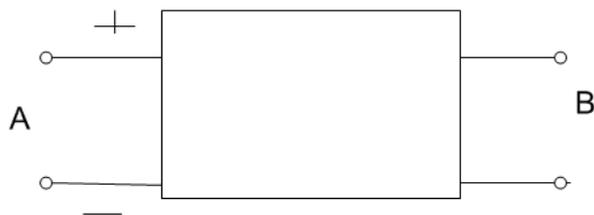
- (a) Increase IOL
- (b) Reduce IOH
- (c) Increase speed of operation
- (d) Reduce power dissipation

96. 7408 is a

- (a) 2 input AND gate
- (b) 2 input OR gate
- (c) 2 input NAND gate
- (d) 2 input NOR gate

97. With 10 V dc connected at port A in the linear nonreciprocal two-port network shown below, the following were observed:

- (i) 1 Ω connected at port B draws a current of 3 A
- (ii) 2.5 Ω connected at port B draws a current of 2 A



With 10 V dc connected at port A, the current drawn by 7 Ω connected at port B is

- (a) $3/7$ A
- (b) $5/7$ A
- (c) $9/7$ A
- (d) 1 A

98. A bulb rated at 50W, 100V is used for 40 minutes. The charge associated with this operation is

- (a) 3600 C
- (b) 1200 C
- (c) 7200 C
- (d) 600 C

99. For 8-point DFT of a real valued sequence, last six points are $_$, $_$, 0 , $3 - 4j$, and $3 + j4$, 0 , $1 + j3$. Then first two points of the DFT are respectively

- (a) $0, 1 - j3$
- (b) $5, 1 + j3$
- (c) $1 + j3, 5$
- (d) $5, 1 - j3$

100. Which among the following material is used for LED

- (a) Si
- (b) Ge
- (c) C
- (d) GaAs
