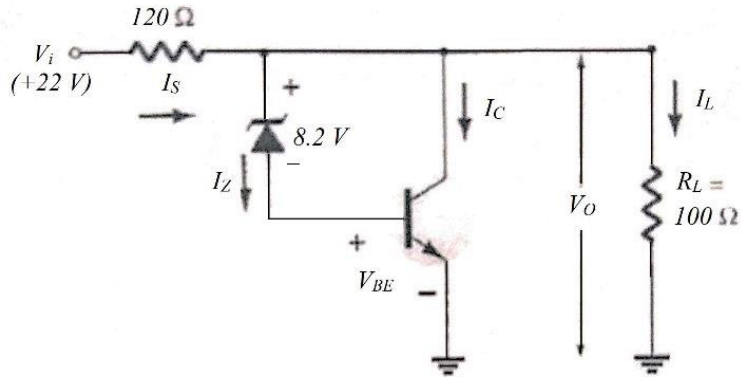


(Post Name: Technical Assistant , Subject/Field: EC , Date of Exam: 28-04-2023 ,
Time of Exam: 4:00 PM)

1. For the given voltage regulator circuit, consider the base-emitter voltage as 0.7 V. Find, $V_O =$ _____ V



- A 8.9
C 9.0

- B 8.0
D 8.5

2. A second order filter has two poles at $s = -0.5 \pm j0.866$ and transmission zero at 2 rad/s. What is the correct transfer function for unity gain at dc?

A $\frac{s^2+4}{s^2+s+1}$

B $\frac{1}{4} \frac{s^2+4}{s^2+s+1}$

C $\frac{s}{s^2+s+1}$

D $\frac{s+2}{s^2+s+1}$

3. Gain of differentiator using op-amp is

A $\omega R_f C_1$

B $\omega / R_f C_1$

C $-j\omega R_f C_1$

D $1/\omega R_f C_1$

4. In PLL, name of phase detector is _____

A Adder

B Subtractor

C Multiplier

D Divider

5. The switching speed of ECL is very high because _____

A Its transistors remain unsaturated

B It uses high speed transistors

C It uses negative logic

D It uses positive logic

6. Minimized form of the following Boolean expression is: $\overline{AB + AC} + \overline{A} \overline{B} C$

A $\overline{A} + \overline{B} \overline{C}$

B $\overline{AB} + \overline{C}$

C $\overline{A} + \overline{A} \overline{B} + \overline{C}$

D All of the above

7. For the function $F(A,B,C,D) = \sum m(0,1,2,5,7,8,13,15)$ answer the following question:

The following term $A'B'C'$ is _____

A a Prime Implicant (PI) only

B an Essential Prime Implicant (EPI) and a PI both

C Neither PI nor EPI

D It is an EPI but not a PI

8. A full adder can be made out of

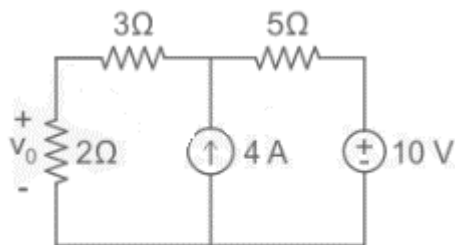
A two half adders

B two half adders and a OR gate

C two half adders and a NOT gate

D three half adders

9. Using superposition theorem, find v_o in the below circuit:



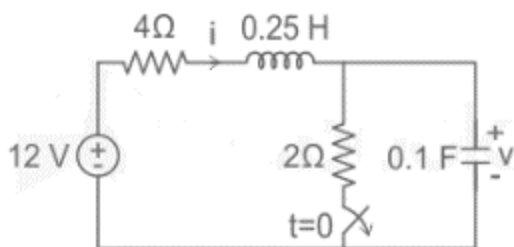
A 2

B 4

C 6

D 8

10. The switch in the circuit shown below has been closed for a long time. It is open at $t = 0$. Determine $\frac{dv}{dt}(0^+)$.



A 0 V/s

B 2 V/2

C 20 V/s

D 200 V/s

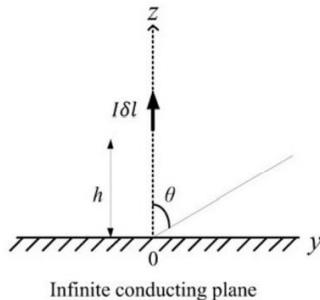
17. In a PCM system each quantization level is encoded into 8 bits. The signal-to-quantization noise ratio is equal to
- | | |
|---------|----------|
| A 24 dB | B 48 dB |
| C 64 dB | D 256 dB |
18. An analog signal has significant spectral components from 1 kHz to 5 kHz. What is the Nyquist sampling rate for this signal?
- | | |
|-----------------|------------------|
| A 5 k samples/s | B 4 k samples/s |
| C 8 k samples/s | D 10 k samples/s |
19. In the case of down-conversion, which of these filters would follow the multiplication with cosine wave?
- | | |
|-------------|------------|
| A Bandstop | B Low pass |
| C High pass | D Bandpass |
20. Code rate r , k information bits and n as total bits, is defined as _____
- | | |
|---------------|---------------|
| A $r = k/n$ | B $k = n/r$ |
| C $r = k * n$ | D $n = r * k$ |
21. Minimum shift keying is similar to _____
- | |
|-------------------------------------------|
| A Continuous phase frequency shift keying |
| B Binary phase shift keying |
| C Binary frequency shift keying |
| D QPSK |
22. Two large, perfectly conducting and grounded plates are inclined at 30° to each other. If a point charge is located midway between them, the number of image charges of the system is
- | | |
|------|------|
| A 3 | B 4 |
| C 12 | D 11 |
23. The polarization in a dielectric material with $\epsilon_r = 2.8$ and $\vec{D} = 3 \times 10^{-7} a_x$ (C/m²) is _____ $\times 10^{-7} a_x$ (C/m²).
- | | |
|--------|--------|
| A 1.93 | B. 3 |
| C 1.8 | D. 2.8 |
24. Region 1 ($x < 0$) is free-space with $\vec{E}_1 = 3a_x + 5a_y - 3a_z$ (V/m).
Region 2 ($x > 0$) is a dielectric ($\epsilon_r = 3.6$) with unknown \vec{E}_2 .
Then at the boundary between the two regions, $\vec{E}_2 =$ _____ (V/m).
- | | |
|---------------------------------|------------------------------|
| A $0.83a_x + 5a_y - 3a_z$ | B $3a_x + 1.39a_y - 0.83a_z$ |
| C $0.83a_x + 1.39a_y - 0.83a_z$ | D $3a_x + 5a_y - 3a_z$ |

25. The modes in a rectangular waveguide are denoted by TE_{mn}/TM_{mn} where m and n are the Eigen numbers along the larger and smaller dimensions of the waveguide, respectively. Which one of the following statement is TRUE?
- A The TM_{10} mode of the waveguide does not exist
 B The TE_{10} mode of the waveguide does not exist
 C The TM_{10} and the TE_{10} mode both exist and have the same cut-off frequency
 D The TM_{10} and the TM_{01} both exist and have the same cut-off frequency

26. An antenna with directive gain of 6dB is radiating a total power of 16kW. The amplitude of the electric field in free space at a distance of 8 km from the antenna in the direction of 6dB gain(rounded off to three decimal places)is _____V/m
- A 0.315 B 0.512
 C 0.244 D 0.895

27. The magnetic field of uniform plane wave in vaccuum is given by
 $\vec{H} = (\hat{a}_x + 2\hat{a}_y + b\hat{a}_z) \cos(\omega t + 3x - y - z)$
 The value of b is
- A 2 B 1
 C 4 D 3

28. For an infinitesimally small dipole in free space, the electric field E_θ in the far field is proportional to $e^{(-\frac{jk r}{r})} \sin\theta$, where $k = 2\pi/\lambda$. A vertical infinitesimally small electric dipole ($\delta l \ll \lambda$) is placed at a distance h ($h > 0$) above an ideal conducting plane, as shown in the figure. The minimum value of h for which one of the maxima in the far field radiation pattern occurs at $\theta = 60$ degree is



- A. λ B. 0.5λ
 C. 0.75λ D. 0.25λ

29. A monostatic pulsed radar operating at 30Ghz has a trasmitter with 2KW O/P power and an antenna with 30dB gain .Minimum detectable signal int the receiver is -100dBm. Determine the maximum range of the radar.if it is required to detect a target having radar cross section of 10sq.m(consider $\log_{10} 4\pi=1.1$). Assume EM wave propagate under ideal conditions
- A 10 Km B 21.5 Km
 C 56 Km D 100 Km

30. Relationship between doppler frequency shift of two radars A and B having 0.1 foot and 0.05 foot wavelength, approaching the target at 1000 feet per second and 2000 feet per second rate respectively, will be
- A Doppler shift of radar A will be $\frac{1}{4}$ of radar B
 - B Doppler shift of radar A will be $\frac{1}{2}$ of radar B
 - C Doppler shift of radar A will be 2 of radar B
 - D Doppler shift of radar A will be same of radar B
31. Consider the following statement :
- if the maximum range of radar has to be doubled
- 1. The peak transmitted power may be increased 16 folds
 - 2. The antenna diameter may be doubled
 - 3. The sensitivity of the receiver may be doubled
 - 4. The transmitted pulse width may be doubled
- A 1, 3, 4
 - B 1 and 2
 - C 2, 3, 4
 - D Only 1
32. In what region of the EM spectrum, Radars are operated?
- A Infrared
 - B Microwave
 - C Ultra-violet
 - D Visible
33. Which of the following bands cannot be used for satellite communication?
- A MF
 - B Ku
 - C X
 - D C
34. The earth area covered by a satellite radio beam is known as
- A Beam width
 - B Band width
 - C Footprint
 - D Zone
35. A geosynchronous satellite
- A has the same period as that of the Earth
 - B has a circular orbit
 - C rotates in the equatorial plane
 - D has all of the above
36. Repeaters inside communication satellites are known as
- A Transceivers
 - B Transponders
 - C Transducers
 - D TWT
37. The range between a ground station and a satellite is 42000 km. Calculate the free space loss at a frequency of 6 GHz.
- A 100 dB
 - B 150 dB
 - C 175dB
 - D 200.4dB

38. How many operational satellites are present in the Iridium system?
 A 32 B 66
 C 50 D 92
39. A graded indexed optical fiber has a parabolic refractive index profile ($\alpha=2$) if the fiber has a numerical aperture = 0.22 the total number of guided mode at the wavelength of 1310nm is given by _____ (assume fibre core radius as $25\mu m$)
 A 174 B 1740
 C 119 D 274
40. The refractive indices of the core and cladding of optical fiber are 1.50 and 1.48 respectively.the critical propagation angle,which is defined as maximum angle that the light beam makes with the axis of the optical fiber to achieve the total internal reflection(rounded off to two decimal places) is_____degree
 A 41.31 B 9.36
 C 16.59 D 15.31
41. In optical fiber rayleigh scattering is proportional to _____
 A $1/\lambda^4$ B $1/\lambda^2$
 C $1/\lambda$ D $1/\lambda^3$
42. Optical fiber works on the principle of_____
 A Reflection B Refraction
 C Scattering D Total internal reflection
43. The physical layer is concerned with_____
 A bit-by-bit delivery B process to process delivery
 C application to application delivery D port to port delivery
44. Which transmission media provides the highest transmission speed in a network?
 A coaxial cable B twisted pair cable
 C optical fiber D electrical cable
45. Two computers C1 and C2 are configured as follows:
 C1 has IP address 203.197.2.53 and netmask 255.255.128.0.
 C2 has IP address 203.197.75.201 and netmask 255.255.192.0.
 which one of the following statements is true?
 A C1 and C2 both assume they are on the same network
 B C2 assumes C1 is on same network, but C1 assumes C2 is on a different network
 C C1 assumes C2 is on same network, but C2 assumes C1 is on a different network
 D C1 assumes C2 is on different network, and C2 assumes C1 is on a different network

56. The unit-impulse response of a system starting from rest is given by $C(t) = 1 - e^{-2t}$ for $t \geq 0$. The transfer function of the system is

A $\frac{1}{1+2s}$ B $\frac{2}{2+s}$

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

57. The closed-loop transfer function of a unity-feedback system is given by

$$\frac{Y(s)}{R(s)} = \frac{1}{(1+\tau s)}$$

Steady-state error to unit-ramp input is _____

A ∞ B tau
C 1 D 1/tau

58. When the initial conditions of a system are specified to be zero, it implies that the system is

- A at rest without any energy stored in it
- B working normally with reference input
- C working normally with zero reference input
- D at rest but stores energy

59. The damping ratio of a system having the characteristic equations $2 + 2s + 8 = 0$ is

A 0.353 B 0.330.
C 0.300 D 0.250

60. Given $X(e^{j\omega}) = 2 + e^{-j\omega} + e^{j\omega} + 3e^{-j3\omega} + 5e^{j4\omega} + 7e^{j7\omega} + 3e^{-j4\omega} + 3e^{-j7\omega}$

The value of $\frac{1}{\pi} \int_{-\pi}^{\pi} X(e^{j\omega}) \cos^2(2\omega) d\omega$ is _____.

A 6 B 1
C 2 D 9

61. Determine which of the following discrete-time LTI system, whose frequency response is given below, is causal?

A $\frac{\sin(\frac{7\omega}{2})}{\sin(\frac{\omega}{2})} e^{-j2\omega}$ B $\frac{\sin(\frac{3\omega}{2})}{\sin(\frac{\omega}{2})} e^{-j\omega}$

C $\frac{\sin(\frac{5\omega}{2})}{\sin(\frac{\omega}{2})} e^{j\omega}$ D $e^{-j3\omega} + e^{j2\omega}$

62. A signal $x[n]$ is passed through a discrete-time system to produce an output $y[n]$. The DTFT of the output ($Y(e^{j\omega})$) is related to the DTFT of the input ($X(e^{j\omega})$) using the following equation:

$$Y(e^{j\omega}) = 3X(e^{j\omega}) + e^{-j\omega}X(e^{j\omega}) + \frac{dX(e^{j\omega})}{d\omega}$$

The value of $Y(e^{j\pi})$, when the input $x[n] = \delta[n]$, is _____.

- | | | | |
|---|---|---|---|
| A | 2 | B | 9 |
| C | 3 | D | 7 |

63. The Laplace transform of $x(t)$ is equivalent to:

- | | |
|---|--------------------------------------------------------|
| A | The Fourier transform of $(e^{\sigma t}x(t))$ |
| B | The Fourier transform of $(e^{j\omega t}x(t))$ |
| C | The Fourier transform of $(e^{(\sigma+j\omega)t}x(t))$ |
| D | The Fourier transform of $(e^{-\sigma t}x(t))$ |

64. Consider an LTI system characterized by $h(t) = f(t) * g(t)$.

Then, $f(t - t_0) * g(t - t_0)$ is equal to:

- | | | | |
|---|---------------|---|---------------|
| A | $h(t)$ | B | $h(t + t_0)$ |
| C | $h(t - 2t_0)$ | D | $h(t + 2t_0)$ |

65. A continuous-time LTI system has a rational system function $H(s)$ with ROC: $a < \text{Re}\{s\} < a^2$. Determine for which value of a , the system is stable:

- | | | | |
|---|---------|---|------------------------|
| A | $a > 1$ | B | $0 < a < 1$ |
| C | $a < 0$ | D | None of these options. |

66. If $X(e^{j\omega})$ is the DTFT of $x[n]$. A new signal $y[n]$ is obtained by inserting 4 zeros between successive values of $x[n]$. If $Y(e^{j\omega})$ is the DTFT of $y[n]$. $Y(e^{j\omega})$ is periodic in ω with period:

- | | | | |
|---|-----------------|---|------------------|
| A | $\frac{\pi}{2}$ | B | $\frac{2\pi}{5}$ |
| C | $\frac{\pi}{3}$ | D | Not periodic |

67. Assume that $X(z)$ is a z-transform for $x[n]$. Given that $X(z) = \log\left(\frac{1}{1 - (\frac{1}{2})^{-1}z}\right)$, where $|z| < \frac{1}{2}$. The value of $x[-2]$ is _____.

- A 2
- B 8
- C 32
- D 64

68. The ROC of z-transform for $x[n] = 3^{|n|} - \left(\frac{1}{2}\right)^n u[n]$ is:

- A $\frac{1}{3} < |z| < 3$
- B $\frac{1}{2} < |z| < 3$
- C $\frac{1}{3} < |z| < \frac{1}{2}$
- D None of these options.

69. In a vibrating reed frequency meter, the natural frequencies of two adjacent reeds have a difference of _____

- A 0.1 Hz
- B 0.25 Hz
- C 0.5 Hz
- D 1.5 Hz

70. For measuring current at high frequency we should use

- A Moving iron instrument
- B Electrostatic instrument
- C Thermocouple Instrument
- D None of the above

71. The power factor of a single-phase load can be calculated if the instruments available are

- A One voltmeter and one ammeter
- B One voltmeter, one ammeter and one wattmeter
- C One voltmeter, one ammeter and one energy meter
- D None of the above

72. An instrument transformer is used to extend the range of

- A Induction instrument
- B Electrostatic instrument
- C Moving coil instrument
- D None of the above

73. The processing required for a single instruction is called ____.

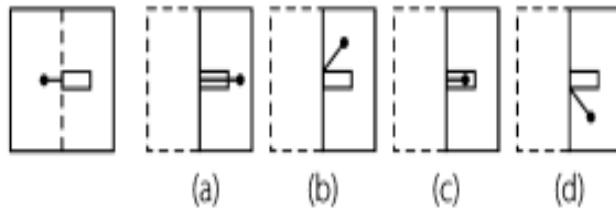
- A Fetch cycle
- B Execution cycle
- C Instruction cycle
- D Branch cycle

74. The CPU of 8085 is organized around ____.

- A Multiple 16-bit internal bus
- B Single 8-bit internal bus
- C Single 16-bit internal bus
- D Multiple 8-bit internal buses

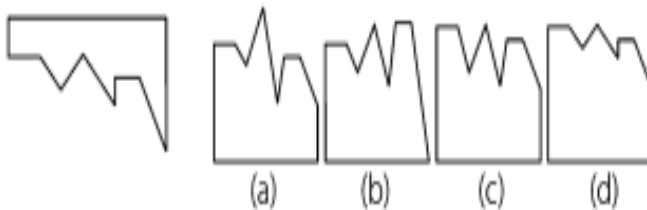
75. ___ is a special purpose register designated to hold the result of an operation performed by the ALU.
- | | | | |
|---|-----|---|-----|
| A | PC | B | IR |
| C | MDR | D | ACC |
76. ___ control unit determines the address of the next instruction to be executed and loads it into the program counter.
- | | | | |
|---|----------------------------|---|-------------------------|
| A | Instruction Interpretation | B | Instruction sequencing |
| C | Instruction Regulation | D | Instruction composition |
77. Carry, Overflow, negative, and zero results are also called ____.
- | | | | |
|---|-------------|---|-------------------|
| A | Flag bits | B | Conditional bits |
| C | Status bits | D | None of the above |
78. The unit vector u in the direction of the vector from $P_1(1,0,1)$ to $P_2(3,2,0)$ is _____
- | | | | |
|----|----------------------------------------------|----|----------------------------------------------|
| A) | $\frac{2}{3}i + \frac{2}{3}j - \frac{1}{3}k$ | B) | $\frac{1}{3}i + \frac{1}{3}j - \frac{1}{3}k$ |
| C) | $\frac{2}{3}i + \frac{2}{3}j - \frac{2}{3}k$ | D) | $\frac{1}{3}i + \frac{2}{3}j - \frac{1}{3}k$ |
79. Using Bisection method, the positive root of $x - \cos x = 0$ lies in the interval
- | | | | |
|----|--------|----|---------|
| A) | (0, 1) | B) | (1, 2) |
| C) | (2, 3) | D) | (-1, 0) |
80. The Laplace Transform of $\cos at$ is
- | | | | |
|----|-----------------------|----|-----------------------|
| A) | $\frac{s}{s^2+a^2}$ | B) | $\frac{1}{(s^2+a^2)}$ |
| C) | $\frac{a^2}{s^2+a^2}$ | D) | NOTA |

81. In the following question, a figure marked on a transparent sheet is given & followed by four answer figures, one of these options resembles the figure, which is obtained by folding the sheet along the dotted line. This option is your answer.



- A. (a) B. (b)
C. (c) D. (d)

82. In the following question, choose the correct answer figure which will make a complete square on joining with the problem figure.



- A. (a) B. (b)
C. (c) D. (d)

83. A and B are sisters. A is mother of D. B has a daughter C who is married to F. G is the husband of A. How is C related to D?
A. Cousin B. Niece
C. Aunt D. Sister-in-law

84. In the following question, select the related number from the given alternatives.
8 : 20 :: 14 : ?
A. 20 B. 38
C. 30 D. 35

90. Fill the blank in for the following series.

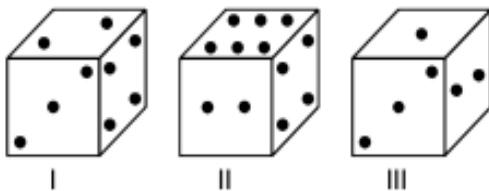
BCB, DED, FGF, HIH, _____

- A. JHJ
B. JKJ
C. JGJ
D. KJK

91. Six friends are sitting in a circle and are facing the centre of the circle. Deepak is between Prakash and Pankaja. Bharti is between Mukesh and Lalita. Prakash and Mukesh are opposite to each other. Who is sitting opposite to Prakash ?

- A. Deepak
B. Mukesh
C. Lalita
D. Pankaja

92. From the given three positions of the same dice, find the number of dots at the face opposite to the face having 3 dots.



- A. 2
B. 4
C. 5
D. 6

93. What can you conclude from the given statements:?

Some planets are moon

Some moons are sun

- A. Some planets are not moon
B. Some planets are sun
C. All planets are not sun
D. All planets are sun

94. Showing a photograph, Ajay says to Nitesh, "The person in the photograph is the son of my mother's sister and is your brother". Which of the following is true?

- A. Nitesh is Ajay's nephew
B. Ajay is Nitesh's brother-in-law
C. Nitesh's mother is Ajay's sister
D. Ajay and Nitesh are cousins

95. If 'waste management techniques' is coded as '25 19 16' in the given language, then how will 'farming fertilizer management' be coded as?

- A. 25,1211
B. 13,25,14
C. 12,13,25
D. 17,13,12

96. Study the following information carefully and answer the questions given below:
 In a certain code language
 'sovia attract class' is written as 'chi ki pa',
 'she are honor sovia' is written as 'din sa chi ta',
 'team teaches ink class' is written as 'la ja pa ha' and
 'she are team' is written as 'din sa ha'.

What is the code for 'teaches'?

- A. Ha
 B. La
 C. Ja
 D. Cannot be determined
97. If * stands for 'addition', / stands for 'subtraction', + stands for 'multiplication', and - stands for 'division', then $20 * 8 / 8 - 4 + 3 = ?$
- A. 22
 B. 21
 C. 23
 D. 24
98. Eight friends, A , B , C , D , E , F , G and H are seated in a circular arrangement facing the center
- (i) AC, DG , HE and FB are seated adjacent to each other. A is also seated adjacent to H
 (ii) B is second to the right of H
 (iii) E is third to the right of C
 (iv) G is opposite to E
- Who is seated exactly opposite to G?
- A. A
 B. B
 C. E
 D. D
99. Choose the figure which is different from the rest.



(1) (2) (3) (4) (5)

- A. 1
 B. 2
 C. 3
 D. 4
100. A cistern has two taps which fill it in 12 minutes and 15 minutes, respectively. There is also a waste pipe in the cistern. When all the pipes are opened, the empty cistern is full in 20 minutes. How long will the waste pipe take to empty a full cistern?
- A. 8 minutes
 B. 10 minutes
 C. 12 minutes
 D. 16 minutes