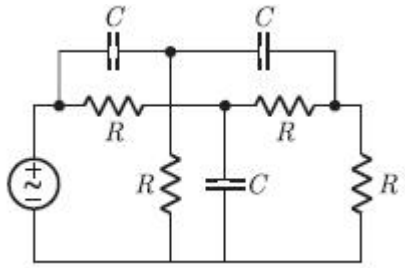
SECTION- B

(Only for candidates appearing in QURAT July'19 –DEPARTMENT E.C.E)

51. The minimum number of equations required to analyse the circuit shown in the figure is



a. 3 b. 4
c. 6 d. 7

52.A superheterodyne receiver is to operate in the frequency range 550 kHz – 1650 kHz, with the intermediate frequency of 450 kHz. Let *R* = *C*max/*C*mindenote the required capacitance ratio of the local oscillator and *I* denote the image frequency (in kHz) of the incoming signal. If the receiver is tuned to 700 kHz, then

a. *R* = 4.41, *I* = 1600
b.*R* = 2.10, *I* – 1150
c. *R* = 3.0, *I* = 600
d.*R* = 9.0, *I* = 1150

53. A sinusoidal signal with peak-to-peak amplitude of 1.536 V is quantized into 128 levels using a mid-rise uniform quantizer. The quantization-noise power is

a. 0.768 V b.48 $10^{-6} V^2$
c. 12 $10^{-6} V^2$ d.3.072 V

54. The Laplace transform of *i*(*t*) is given by

$I(s) = 2/s(1+s)$

At $t \rightarrow infinity$, The value of *i*(*t*) tends to

a. 0 b. 1
c. 2 d. Infinity

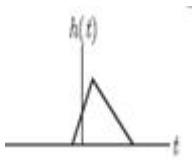
55. The first and the last critical frequency of an *RC* -driving point impedance function must respectively be

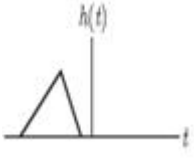
a. A zero and a pole
b. A zero and a zero
c. A pole and a pole
d. A pole and a zero

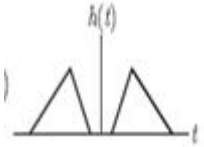
56. The cascade amplifier is a multistage configuration of

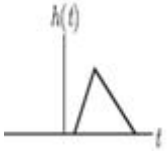
a.CC – CB b.CE – CB
c.CB - CC d.CE – CC

57. Which of the following can be impulse response of a causal system?

a. 

b. 

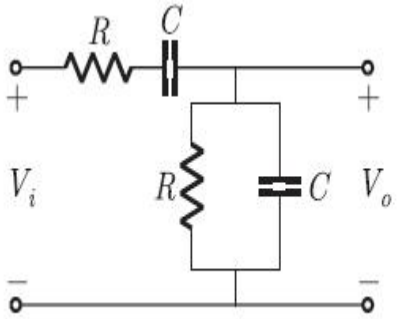
c. 

d. 

58. Despite the presence of negative feedback, control systems still have problems of instability because the

a. Components used have non- linearities
b. Dynamic equations of the subsystem are not known exactly.
c. Mathematical analysis involves approximations.
d. System has large negative phase angle at high frequencies.

59. The *RC* circuit shown in the figure is



a. A low-pass filter
b. A high-pass filter
c. A band-pass filter
d. A band-reject filter

60. In a *pn* junction diode under reverse biased the magnitude of electric field is maximum at

a. The edge of the depletion region on the *p*-side
b. The edge of the depletion region on the *n*-side
c. The*pn* junction
d. The centre of the depletion region on the *n*-side

61. The Boolean function $Y = AB + CD$ is to be realized using only 2 – input NAND gates. The minimum number of gates required is
a. 2 b. 3
c. 4 d. 5

62. In a transconductance amplifier, it is desirable to have
a. A large input resistance and a large output resistance
b. A large input resistance and a small output resistance
c. A small input resistance and a large output resistance
d. A small input resistance and a small output resistance

63. Match the following and choose the correct combination:

Group I

E. Newton-Raphson method

F. Runge-kutta method

G. Simpson's Rule

H. Gauss elimination

Group 2

1. Solving nonlinear equations
2. Solving linear simultaneous equations
3. Solving ordinary differential equations
4. Numerical integration
5. Interpolation

a.E - 6, F – 1,G - 5, H – 3
b.E - 1, F - 6,G - 4, H – 3
c.E - 1, F - 3,G - 4, H – 2
d.E - 5, F - 3,G - 4, H – 1

64. In an ideal differential amplifier shown in the figure, a large value of (*RE*).
a. Increase both the differential and common - mode gains.
b. Increases the common mode gain only.
c. Decreases the differential mode gain only.
d. Decreases the common mode gain only.

65. In delta modulation, the slope overload distortion can be reduced by
a. Decreasing the step size
b. Decreasing the granular noise
c. Decreasing the sampling rate
d. Increasing the step size

66. Calculation of Eigenvalues
Given an orthogonal matrix

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

$[AA^T]^1$ is

a. $\begin{bmatrix} \frac{1}{4} & 0 & 0 & 0 \\ 0 & \frac{1}{4} & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & \frac{1}{2} \end{bmatrix}$ b. $\begin{bmatrix} \frac{1}{2} & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & \frac{1}{2} \end{bmatrix}$

a.

c $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ d $\begin{bmatrix} \frac{1}{4} & 0 & 0 & 0 \\ 0 & \frac{1}{4} & 0 & 0 \\ 0 & 0 & \frac{1}{4} & 0 \\ 0 & 0 & 0 & \frac{1}{4} \end{bmatrix}$

67. In a Direct Sequence CDMA system the chip rate is 1.2288 * 10^6chips per second. If the processing gain is desired to be AT LEAST 100, the data rate
a. Must be less than or equal to 12.288 * 10^3 bits per sec
b. Must be greater than 12.288 * 10^3bits per sec
c. Must be exactly equal to 12.288 * 10^3bits per sec
d. Can take any value less than 122.88 * 10^3bits per sec

68. The if ratio or the average energy of Constellation 1 to the average energy of Constellation 2 is
a.$4a^2$ b. 4
c. 2 d. 8

69. If

$$V_i = V\sin(\omega t) \text{ and } V = V\sin(\omega t + \phi)$$

, then the minimum and maximum values of φ (in radians) are respectively

a. $-\frac{\pi}{2}$ and $\frac{\pi}{2}$

b. 0 and $\frac{\pi}{2}$

c. $-\pi$ and 0

d. $-\frac{\pi}{2}$

70. After execution of line 7 of the program, the status of the *CY* and *Z* flags will be

a.*CY* = 0, *Z* = 0
b.*CY* = 0, *Z* = 1
c.*CY* = 1, *Z* = 0
d.*CY* = 1, *Z* = 1

71. *n*-type silicon is obtained by doping silicon with

a. Germanium b. Aluminium
c. Boron d. Phosphorus

72. Choose proper substitutes for *X* and *Y* to make the following statement correct
Tunnel diode and Avalanche photo diode are operated in *X* bias ad *Y* bias respectively

a.*X*: reverse, *Y*: reverse
b.*X*: reverse, *Y*: forward
c.*X*: forward, *Y*: reverse
d.*X*: forward, *Y*: forward

73. At 300 K, for a diode current of 1 mA, a certain germanium diode requires a forward bias of 0.1435 V, whereas a certain silicon diode requires a forward bias of 0.718 V. Under the conditions state above, the closest approximation of the ratio of reverse saturation current in germanium diode to that in silicon diode is

a. 1 b. 5
c.4 * 10^3 d.8 * 10^3

74. When the gate-to-source voltage (*VGs*) of a MOSFET with threshold voltage of 400 mV, working in saturation is 900 mV, the drain current is observed to be 1 mA. Neglecting the channel width modulation effect and assuming that the MOSFET is operating at saturation, the drain current for an applied *VGS* of 1400 mV is

a. 0.5 mA b. 2.0 mA
c. 3.5 mA d. 4.0 mA

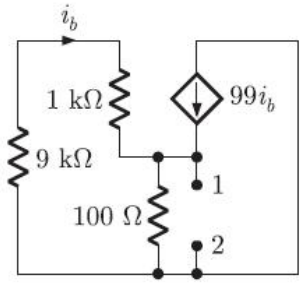
75. The action of JFET in its equivalent circuit can best be represented as a

a. Current controlled current source
b. Current controlled voltage source
c. Voltage controlled voltage source
d. Voltage controlled current source

76. The output *Y* of a 2-bit comparator is logic 1 whenever the 2-bit input *A* is greater than the 2-bit input *B*. The number of combinations for which the output is logic 1, is

a. 4 b. 6
c. 8 d. 10

77. The impedance looking into nodes 1 and 2 in the given circuit is (Ω = w)



a. 50 W b. 100 W
c. 5 kW d. 10.1 kW

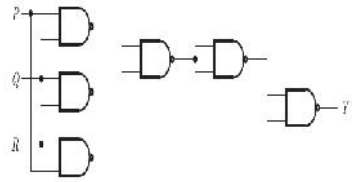
78. An analog signal is band-limited to 4 kHz, sampled at the Nyquist rate and the samples are quantized into 4 levels. The quantized levels are assumed to be independent and equally probable. If we transmit two quantized samples per second, the information rate is _____ bits / second.

a. 1 b. 2
c. 3 d. 4

79. A system is defined by its impulse response $h(n) = 2^n u(n - 2)$. The system is

a. stable and causal
b. causal but not stable
c. stable but not causal
d. unstable and non-causal

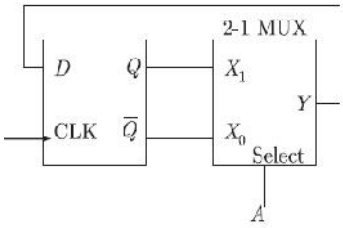
80. The output *Y* in the circuit below is always '1' when

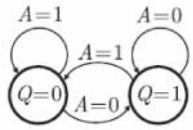


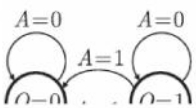
a. Two or more of the inputs P, Q, R are'0'
b. Two or more of the inputs P, Q, Rare '1'
c. Any odd number of the inputs P, Q, R is '0'
d. Any odd number of the inputs P, Q, R is '1'

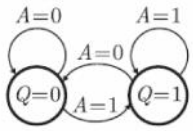
81. Drift current in the semiconductors depends upon
a. Only the electric field
b. Only the carrier concentration gradient
c. Both the electric field and the carrier concentration
d. Both the electric field and the carrier concentration gradient

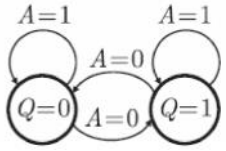
82. The state transition diagram for the logic circuit shown is



a.


b.


c.


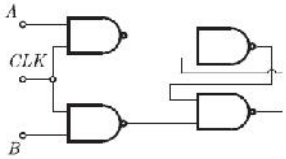
c


83. The maximum value of $f(x) = x^3 - 9x^2 + 24x + 5$ in the interval [1,6] is
a. 21 b. 25
c. 41 d. 46

84. With 10 V dc connected at port *A*, the current drawn by 7 W connected at port *B* is (Ω = W)
a. 3/7 A b. 5/7 A
c. 1A d. 9/7 A

85. For the same network, with 6 V dc connected at port *A*, 1 W connected at port *B* draws 7/3 A. If 8 V dc is connected to port *A*, the open circuit voltage at port*B* is
a. 6 V b. 7 V
c. 8 V d. 9 V

86.Consider the given circuit



In this circuit, the race around
a. Does not occur
b. Occur when *CLK* = 0
c. Occur when *CLK* = 1 and *A* = *B* = 1
d. Occur when *CLK* = 1 and *A* = *B* = 0

87. Two independent random variables *X* and *Y* are uniformly distributed in the interval [-1,1]. The probability that max [*X*,*Y*] is less than 1/2 is
a. 3/4 b. 9/16
c. 1/4 d. 2/3

88. A Zener diode, when used in voltage stabilization circuits, is biased in
a. Reverse bias region below the breakdown voltage
b. Reverse breakdown region
c. Forward bias region
d. Forward bias constant current mode

89. The solution of the differential equation $dx/dy = ky$, $y(0) = c$ is
a. $x = ce^{-ky}$ b. $x = ke^{cy}$
c. $y = ce^{kx}$ d. $y = ce^{-kx}$

90. The **Column-I** lists the attributes and the **Column-II** lists the modulation systems. Match the attribute to the modulation system that best meets it

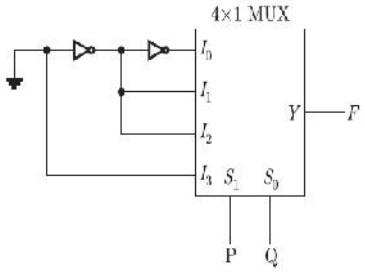
Column-I
P. Power efficient transmission of signals
Q. Most bandwidth efficient transmission of voice signals
R. Simplest receiver structure
S. Bandwidth efficient transmission of signals with Significant dc component

Column-II
1. Conventional AM
2. FM
3. VSB
4. SSB-SC

a. P-4;Q-2;R-1;S-3
b. P-2;Q-4;R-1;S-3
c. P-3;Q-2;R-1;S-4
d. P-2;Q-4;R-3;S-1

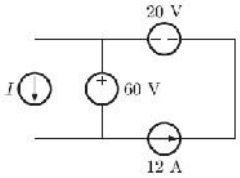
91. The trigonometric Fourier series of an even function does not have the
a. DC term
b. Cosine terms
c. Sine terms
d. Odd harmonic terms

92. The logic function implemented by the circuit below is (ground implies logic 0)



a.*F* = AND(*P*,*Q*)
b.*F* = OR (*P*,*Q*)
c.*F* = *X* NOR (*P*,*Q*)
d.*F* = *X* OR (*P*,*Q*)

93. In the interconnection of ideal sources shown in the figure, it is known that the 60 V source is absorbing power.



Which of the following can be the value of the current source *I* ?
a. 10 A b. 13 A
c. 15 A d. 18 A

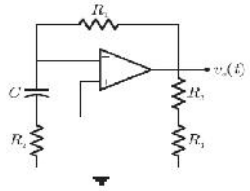
94. In a microprocessor, the service routine for a certain interrupt starts from a fixed location of memory which cannot be externally set, but the interrupt can be delayed or rejected such an interrupt is
a. Non-maskable and non-vectored
b. Maskable and non-vectored
c. Non-maskable and vectored
d. Maskable and vectored

95. Match each differential equation in **Group I** to its family of solution curves from **Group II**

Group I		**Group II**
A.	*dx/dy= y/x*	1. Circles
B.	*dx/dy=-y/x*	2. Straight lines
C.	*dx/dy=x/y*	3. Hyperbolas
D.	dx/dy=-x/y	

a.A - 2, B - 3,C - 3,D - 1
b.A - 1, B - 3,C - 2,D - 1
c.A - 2, B - 1,C - 3,D - 3
d.A - 3, B - 2,C - 1,D - 2

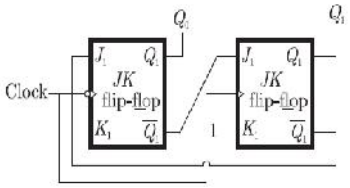
96. In the following a stable multivibrator circuit, which properties of *v*0(*t*) depend on *R*2?



a. Only the frequency
b. Only the amplitude
c. Both the amplitude and the frequency
d. Neither the amplitude nor the frequency

97. What are the minimum number of 2- to -1 multiplexers required to generate a 2- input AND gate and a 2- input Ex-OR gate
a. 1 and 2 b. 1 and 3
c. 1 and 1 d. 2 and 2

98. What are the counting states (*Q*1,*Q*2) for the counter shown in the figure below



a.11,10,00,11,10,...
b.01,10,11,00,01...
c.00,11,01,10,00...
d.01,10,00,01,10...

99. Norton's theorem states that a complex network connected to a load can be replaced with equivalent impedance
a. In series with a current source
b. In parallel with a voltage source
c. In series with a voltage source
d. In parallel with a current source

100. In CMOS technology, shallow P-well or N -well regions can be formed using
a. Low pressure chemical vapour deposition
b. Low energy sputtering
c. Low temperature dry oxidation
d. Low energy ion-implantation