Total No. of Printed Pages : 21

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A

SET-Z

M.Phil./Ph.D./URS-EE-2020

SUBJECT : Electronics & Communication Engg.

Sr. No. 10001

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name_____

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SEAL

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3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
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6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
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1. Given that :

$$A=\begin{bmatrix}-5 & -3\\ 2 & 0\end{bmatrix} \text{ and } I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

The, the value of A^3 is :

(1) $15A + 12I$ (2) $19A + 30I$

(3) $17A + 15I$ (4) $17A + 21I$

2. A fair coin is tossed 10 times. What is the probability that only the first two tosses will yield heads ?

(1) $\left(\frac{1}{2}\right)^2$ (2) ${}^{10}C_2\left(\frac{1}{2}\right)^2$

(3) $\left(\frac{1}{2}\right)^{10}$ (4) ${}^{10}C_2\left(\frac{1}{2}\right)^{10}$

3. $I=\int_0^1 x^5\sqrt{(1-x^2)^5}\,.dx =$

(1) $\frac{8}{693}$ (2) $\frac{5}{317}$ (3) $\frac{8}{315}$ (4) $\frac{41}{720}$

4. Match the following and choose the correct combination :

Group-1		Group-2	
A.	Newton-Raphson method	1.	Solving non-linear equations
B.	Runge-Kutta method	2.	Solving linear simultaneous equations
C.	Simpson's rule	3.	Solving ordinary differential equations
D.	Gauss elimination	4.	Numerical integration
		5.	Interpolation
		6.	Calculation of eigen values

(1) A - 6, B - 1, C - 5, D - 3 (2) A - 1, B - 6, C - 4, D - 3

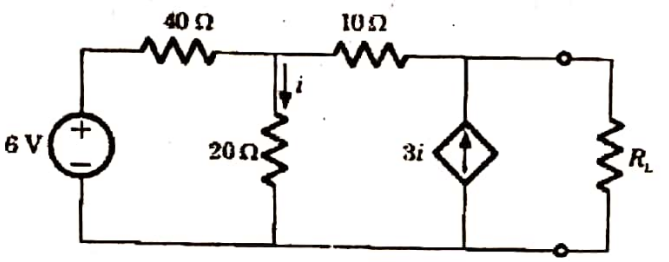
(3) A - 1, B - 3, C - 4, D - 2 (4) A - 5, B - 3, C - 4, D - 1

5. The length of arc of the curve $x = t^2$, $y = t^2$ from $t = 0$ to $t = 4$ is :

(1) $\frac{8}{27}\left(37\sqrt{37} - 1\right)$ (2) $\frac{3}{5}\left(\sqrt{2} - 1\right)$

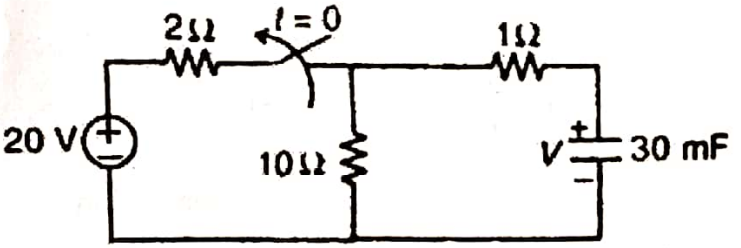
(3) $\frac{5}{21}$ (4) $\frac{5-\sqrt{3}}{2}$

6. In the circuit given below, the R_L will absorb maximum power if R_L is equal to :



(1) 40/3 Ohm (2) 60/3 Ohm (3) 70/3 Ohm (4) 20/3 Ohm

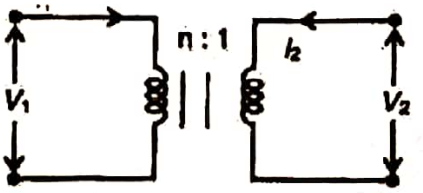
7. In the circuit given below the switch is opened at $t = 0$ after long time. The voltage $v(t)$ for $t \geq 0$ is :



(1) $50/3\, e^{(-t/0.33)}$ V (2) $15/3\, e^{(-t/0.33)}$ V

(3) $50/3\, e^{(-t/30)}$ V (4) $50/3\, e^{(-0.33t)}$ V

8. From the *ABCD* parameters of an ideal n : 1 transformer shown in figure below, the value of *D* is :



(1) n (2) $1/n$ (3) n^2 (4) $1/n^2$

9. Fourier transform of the signal $u(t)$ is given by :

(1) 1 (2) $\pi\delta(\omega) - 1/j\omega$

(3) $2\pi\delta(\omega)$ (4) $\pi\delta(\omega) - j/\omega$

10. A series resonant circuit has L = 20 mH and C = 10 mF. The required R for the bandwidth of 50 Hz is :

(1) 16 Ohm (2) 1 Ohm (3) 0.1 Ohm (4) 10 Ohm

11. For a silicon p + n junction diode the doping concentrations are $N_a = 10^{15}\,cm^{-3}$ and $N_d = 10^{10}\,cm^{-3}$. The minority carrier hole diffusion coefficient is $D_p = 10\ cm^2/s$ and the minority carrier hole life time is $\tau_{p0} = 10^{-5}$ s. The cross sectional area is $A = 10^{-4}\,cm^2$. The reverse saturation current is ($n_i = 1.5 \times 10^{-10}/cm^3$) :

(1) 36×10^{-12} A (2) 3.6×10^{-12} A

(3) 36×10^{-10} A (4) 3.6×10^{-10} A

12. Match A (equations) with B (relations) :

A		B	
P.	Continuity Equation	1.	Relates diffusion constant with mobility
Q.	Einstein's Equation	2.	Relates charge density with electric field
R.	Poisson's Equation	3.	Concentration gradient
S.	Diffusion Current	4.	Rate of charge of minority carrier density with time

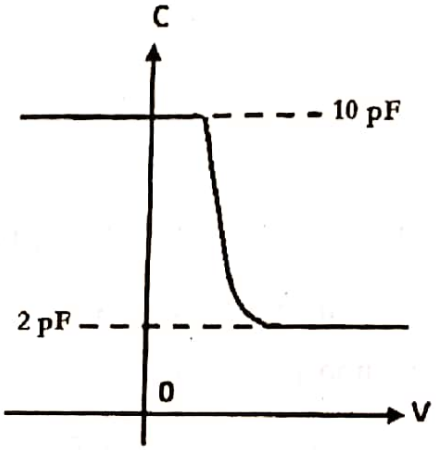
(1) P - 4, Q - 1, R - 3, S - 2 (2) P - 4, Q - 1, R - 2, S - 3

(3) P - 1, Q - 4, R - 2, S - 3 (4) P - 1, Q - 4, R - 3, S - 2

13. A Ge diode has a saturation current of 10 μA at room temperature. Then, the reverse current at T = 350° K is :

(1) 32 mA (2) 8.42 mA (3) 0.32 mA (4) 3.2 μA

14. The figure shows the high-frequency capacitance-voltage characteristics of a MOS capacitor. Assume that the permittivities of silicon and SiO_2 are 1×10^{-12} F/cm and 3.5×10^{-13} F/cm respectively. Calculate the capacitance in depletion mode.



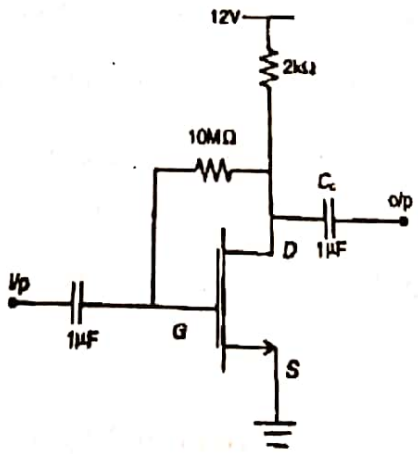
(1) 12 pF (2) 5 pF (3) 1.5 pF (4) 2.5 pF

15. If P is passivation, Q is n-well implant, R is metallization and S is source/drain diffusion, then the order in which they are carried out in a standard n-well CMOS fabrication process is :

(1) S – R – Q – P (2) R – P – S – Q

(3) Q – S – R – P (4) P – Q – R – S

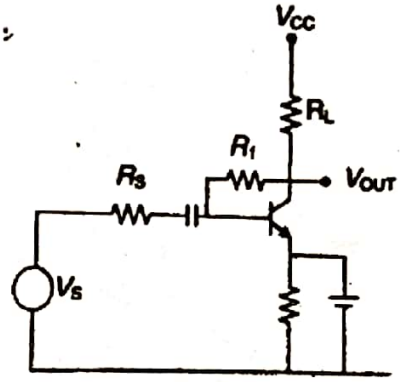
16. In the circuit given below, the parameters are $K = 0.2 \times 10^{-3} A/V^2$, $V_T = 3v$, $Y_d = 20$ μS, $V_{GSQ} = 6.4\ V$, $I_{DQ} = 2.75$ mA. The output impedance z_0 and gain A_V is :



(1) 19.23 kΩ, –3.14 (2) 1.923 kΩ, 3.14

(3) 1.923 kΩ, –3.14 (4) 12.93 kΩ, –31.4

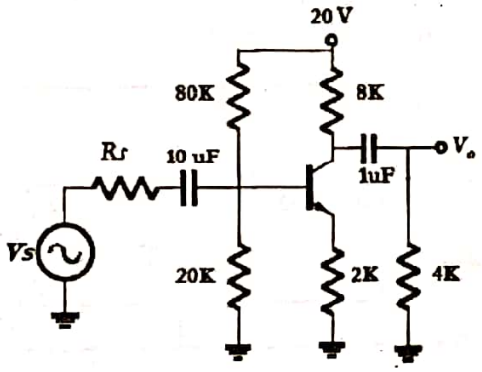
17. The type of feedback in the given circuit is :



(1) Voltage shunt (2) Current shunt

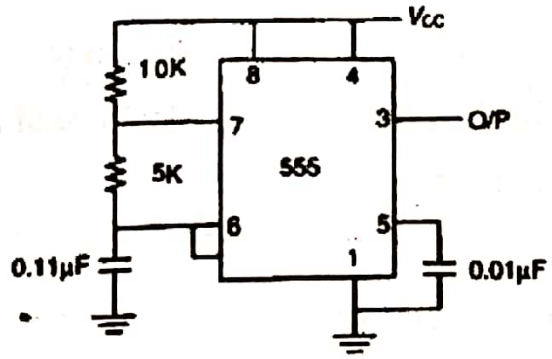
(3) Voltage series (4) Current series

18. The gain A_V of the circuit shown below is :



(1) −169 (2) −183 (3) −160 (4) −16.9

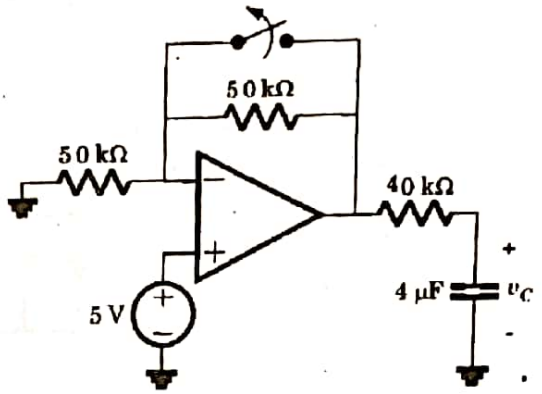
19. The 555 timer circuit as shown in figure generates a rectangular waveform. The frequency and duty cycle of the waveform are :



(1) 660 Hz, 0.45 (2) 660 Hz, 0.25

(3) 66 Hz, 0.25 (4) 6.6 Hz, 0.25

20. The circuit shown below is at steady state before the switch opens at $t = 0$. The $v_c(t)$ for $t > 0$ is :



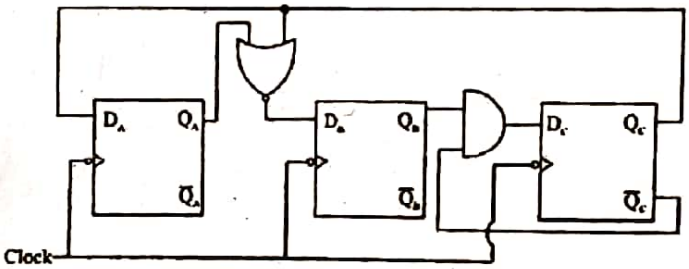
(1) $10 - 5e^{-6.25t}$ V

(2) $5 + 5e^{-6.25t}$ V

(3) $5 + 5e^{-t/6.25}$ V

(4) $10 - 5e^{-t/6.25}$ V

21. If all flip-flops are reset to '0' at power on, then the total number of output states (*ABC*) represented by this counter is equal to :



(1) 3 (2) 5 (3) 4 (4) 7

22. Given $F = F_1.F_2$, where $F(A, B, C, D) = \Sigma m\ (4, 7, 15)$, $F_1(A, B, C, D) = \Sigma m\ (0, 1, 2, 3, 4, 7, 8, 9, 10, 11, 15)$, the possible function for F_2 is :

(1) $\Sigma m\ (5, 6, 12, 13, 14)$

(2) $\Sigma m\ (4, 5, 6, 7, 8, 12, 13, 14, 15)$

(3) $\Sigma m\ (5, 6, 12, 13, 4, 7, 15)$

(4) None of these

23. 1000 H : LXI SP, 0FFFH

CALL 2050H

After call, content of PC and SP is :

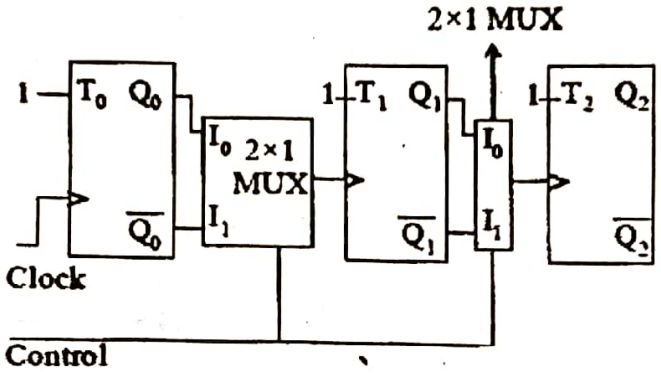
(1) PC = 1006 H, SP = 0FFFH

(2) PC = 2050 H, SP = 0FFFH

(3) PC = 2050 H, SP = 0FFDH

(4) PC = 1006 H, SP = 0FFDH

24. For the given sequential circuit, which of the following statements are true :



a. For control = 0 it will acts as down counter

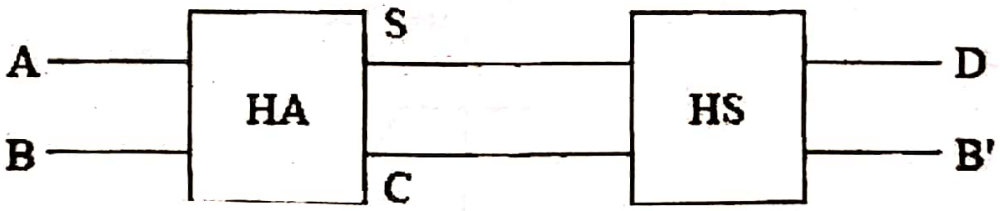
b. For control = 1 it will acts at up counter

c. Synchronous counter

d. Asynchronous counter

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

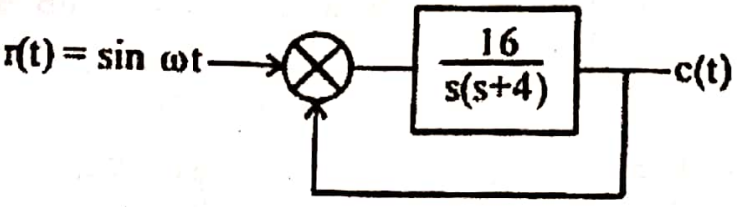
25. The half adders and half substractor are connected as shown in figure below. The output D and B' are :



(1) $D = A \oplus B;\ B' = AB$ (2) $D = A + B;\ B' = 0$

(3) $D = AB;\ B' = 0$ (4) $D = A + B;\ B' = AB$

26. In the system shown below, the steady state response c(t) will exhibit a resonant peak at a frequency of ..... rad/sec. (rounding up to 2 decimals)



(1) $2\sqrt{2}$ (2) $4\sqrt{2}$ (3) $6\sqrt{2}$ (4) $8\sqrt{2}$

27. TF of a unity feedback system is $\frac{1}{(4s^2+s+4)}$. The magnitude of the system at 0.1591 Hz is approximately ..... dB.

(1) 0 (2) 1 (3) 2 (4) 3

28. By performing cascading / summing / differencing operations using transfer function blocks $G_1(s)$ and $G_2(S)$ one cannot realize a transfer function of the form :

(1) $G_1(S)\ G_2(S)$ (2) $\frac{G_1(S)}{G_2(S)}$

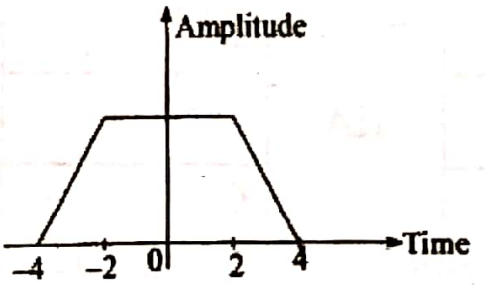
(3) $G_2(S)\left(\frac{1}{G_1(S)}+G_2(S)\right)$ (4) $G_1(S)\left(\frac{1}{G_1(S)}-G_2(S)\right)$

29. The impulse response of a discrete LTI system is given by $h(n) = -(0.25)^{-n}\,u\,(n-4)$. The system is :

(1) Causal and stable (2) Causal and unstable

(3) Non causal and stable (4) Non-causal and unstable

30. The graph shown below represents a wave form obtained by convolving two rectangular waveform of duration :



(1) 4 units each (2) 4 and 2 units respectively

(3) 6 and 3 units respectively (4) 6 and 2 units respectively

31. An AWGN is transmitting symbols at an SNR = 30 dB. The channel capacity per symbol in the channel is :

(1) 2 bits (2) 4 bits (3) 5 bits (4) 8 bits

32. AM signal is detected using an envelope detector. With carrier frequency set at 200 Mhz and modulating signal frequency being 20 kHz, the approximate value of time constant of envelope detector is :

(1) 5 ns (2) 60 µs (3) 70 µs (4) 2.5 ns

33. A sinusoidal signal with peak to peak voltage at 2 V is quantized into 128 levels using a midrise uniform quantizer. The quantization noise power is :

(1) 2 μW (2) 10 μW (3) 40 μW (4) 20 μW

34. In a FM system, a 10 MHz carrier is modulated by a sinusoidal signal of frequency 2 kHz. Using Carson's approximation bandwidth required is 0.1 MHz. If $y(t)$ = (modulated signal)^3. Then by using Carson's approximation, the bandwidth of $y(t)$ around 30 MHz is :

(1) 0.1 MHz (2) 0.2 MHz (3) 0.3 MHz (4) 0.5 MHz

35. The input to the matched filter is given by

$s(t) = 20\sin(2\pi \times 10^5 t)$ for $0 < t < 10^{-3}$ s

$= 0$ elsewhere

The peak amplitude of filter output is :

(1) 20 V (2) 2 V (3) 10 V (4) 0.2 V

36. Which of the following does ***not*** satisfy the wave equation ?

(1) $Ae^{j(wt-2z)}$ (2) $\cos(w(z + t))$

(3) $\cos x . \cos t$ (4) $\cos(y^3 + 5t)$

37. The electric field intensity vector of a plane wave is given by $E(r, t) = 10 \sin(6000t + 0.06x + 20a_y)$ where a_y denotes unit vector along y direction. The wave is propagating with a phase velocity of :

(1) 1×10^5 m/s (2) 1×10^6 m/s (3) -1×10^5 m/s (4) -1×10^6 m/s

38. If the length of the short-circuited transmission line is given as : $3/4.\lambda < l < \lambda/2$, then the input impedance is :

(1) Inductive

(2) Capacitive

(3) Zero

(4) Contains both real and imaginary parts

39. A quarter wave transformer matching a 50 Ohm source with a 200 Ohm load should have a characteristic impedance of :

(1) 50 Ohm (2) 100 Ohm (3) 150 Ohm (4) 200 Ohm

40. Match **A** (theorem) with **B** (description) :

	A		B
P.	curl $\vec{F} = 0$	1.	Gauss theorem
Q.	div $\vec{F} = 0$	2.	Irrotational
R.	$\iiint_V (\nabla . F) dV = \oiint_S F . dS$	3.	Solenoidal
S.	$\oiint_S F . dS = Q$	4.	Divergence theorem

(1) P - 2, Q - 3, R - 4, S - 1 (2) P - 3, Q - 2, R - 4, S - 1

(3) P - 2, Q - 3, R - 1, S - 4 (4) P - 2, Q - 4, R - 3, S - 1

41. The Fermi level of a metal is the :

(1) Energy at which the probability of finding an electron is 1/2.

(2) The highest energy an electron can possess inside the metal.

(3) The energy required to take an electron from metal to vacuum.

(4) The lowest energy an electron possess at 0K.

42. In a semiconductor, the probability of finding an electron at an energy ΔE above the bottom of the conduction band is always ..... the probability of finding a hole at an energy ΔE below the top of the valence band.

(1) greater than (2) equal to

(3) less than (4) unequal to

43. In the piecewise linear diode model, the diode resistance is :

(1) low for all biases

(2) high for all biases

(3) low for biases greater than cut-in voltage and high for biases less than cut-in voltage

(4) high for biases greater than cut-in voltage and low for biases less than cut-in voltage

44. In the triode region, the $I_D - V_{DS}$ characteristics of a MOSFET are :

(1) hyperbolic (2) linear (3) quadratic (4) exponential

45. In the common emitter configuration, if the transistor is in the saturation region, then :

(1) $I_C > I_E$ (2) $I_C < \beta I_B$ (3) $I_E < I_B$ (4) $I_B > \beta I_C$

46. The LEVEL 1 SPICE model implements :

(1) Square Law model (2) Alpha Power Law model

(3) Injection Velocity model (4) Velocity Saturation model

47. BSIM 1 is a :

(1) Charge based model

(2) Threshold voltage based model

(3) Surface potential based model

(4) None of the above

48. PSP is a :

(1) Charge based model (2) Threshold voltage based model

(3) Surface potential based model (4) None of the above

49. EKV is a :

(1) Charge based model

(2) Threshold voltage based model

(3) Surface potential based model

(4) None of the above

50. BSIM4 model considers the influence of narrow width effect (NWE) on :

(1) Mobility only (2) Threshold voltage only

(3) Saturation velocity only (4) All of the above

51. Which one of the following is ***not*** the advantage of ion-implantation over diffusion doping ?

(1) It is a low temperature process.

(2) Point imperfections are not produced.

(3) Shallow doping is possible.

(4) Gettering is possible.

52. Imperfection arising due to the displacement of an ion from a regular site to an interstitial site maintaining overall electrical neutrality of the ionic crystal is called :

(1) Frenkel imperfection

(2) Schottky imperfection

(3) Point imperfection

(4) Volume imperfection

53. Four probe method is used to measure :

(1) resistivity of semi-conducting material

(2) mobility of carriers

(3) carrier concentration

(4) none of the above

54. In photolithography, higher the radiation wavelength :

(1) smaller is the minimum feature size

(2) larger is the minimum feature size

(3) feature size is independent of it

(4) none of these

55. Hall effect can be used to measure :

(1) mobility of carriers

(2) type of semiconductor

(3) carrier concentration

(4) all of these

56. Etching is always anisotropic if the material is :

(1) Crystalline
(2) Polycrystalline
(3) Amorphous
(4) None of the above

57. The steady state conditions in diffusion are governed by :

(1) Fick's second law
(2) Fick's first law
(3) Both (1) and (2)
(4) Maxwell-Boltzmann's law

58. A heavily doped buried layer is used in bipolar IC technology to :

(1) bury the defects in Silicon below the active epitaxial layer

(2) reduce the resistance to current flow from the active layer to the substrate

(3) Prevent latchup

(4) reduce the collector resistance of the bipolar transistor

59. While diffusing an impurity into silicon, if the concentration of the impurity atoms is maintained constant at the surface of the wafer, then the diffused impurity profile is a :

(1) Gaussian
(2) Exponential
(3) Quadratic
(4) Complementary error function

60. If aluminum is deposited Upon a lightly doped n-region :

(1) A schottky diode is obtained

(2) An ohmic contact is obtained

(3) A constant capacitance is obtained

(4) A high valued constant resistance can be obtained

61. The threshold voltage of an *n*-channel MOSFET can be increased by :

(1) Increasing the channel dopant concentration

(2) Reducing the channel dopant concentration

(3) Reducing the gate oxide thickness

(4) Reducing the channel length

62. In modern technology, the gate material used for a MOSFET is :

(1) Heavily doped polycrystalline silicon

(2) Pure silicon

(3) High purity silica oxide

(4) Epitaxial grown silicon

63. A certain gate draws 1.8μA when its output is HIGH and 3.3μA when its output is LOW. V_{CC} is 5V and the gate is operated on a 50% duty cycle. The average power dissipation (P_D) is :

(1) 2.55 μW (2) 1.27 μW (3) 12.75 μW (4) 5 μW

64. In BiCMOS circuits :

(1) CMOS is used for implementing logic and BJT is used for high drive current

(2) BJT is used for implementing logic and CMOS is used for high drive current

(3) CMOS is used for implementing logic and BJT is used for low power

(4) CMOS is used for high speed and BJT is used for high drive current

65. Propagation delay of a cell primarily depends on :

(1) Output transition and input load

(2) Input transition and output load

(3) Input transition and output transition

(4) Input load and output load

66. If metal 6 and metal 7 are used for the power in 7 metal layer process design then which metals you will use for clock ?

(1) Metal 1 and metal 2 (2) Metal 3 and metal 4

(3) Metal 4 and metal 5 (4) Metal 6 and metal 7

67. Emitter-coupled logic (ECL) is the fastest bipolar transistor logic because :

(1) it uses current, rather than voltages, as the output variables

(2) it uses a circuit configuration that prevents the transistors from going into saturation

(3) it has no p-n-p transistors

(4) it uses differential inputs

68. A Schmitt trigger circuit achieves hysteresis by utilizing :

(1) the magnetic properties of a transformer code

(2) avalanche multiplication in a zener (tunnel) diode

(3) the Barkhausen principle

(4) regenerative positive feedback

69. When a step input is applied to an inverter made with an n-p-n transistor, such that the transistor goes from cutoff to saturation, there is a delay time (t_d) before the output goes low. The delay time is due partly to :

(1) the stored minority carrier charge in the base

(2) the charging of the base-collector junction capacitance

(3) the charging of the base-emitter junction capacitance

(4) the discharging of the minority carrier stored charge in the collector

70. Which equation related to noise margins is ***correct*** ?

(1) $V_{NL} = V_{IL(\max)} + V_{OL(\max)}$ (2) $V_{NH} = V_{OH(\min)} + V_{IH(\min)}$

(3) $V_{NL} = V_{OH(\min)} - V_{IH(\min)}$ (4) $V_{NH} = V_{OH(\min)} - V_{IH(\min)}$

71. Consider an Ideal voltage amplifier with a gain of 0.95 and a resistance R = 100 KΩ connected between output and input terminals. Use Miller's theorem to find the input resistance of this circuit :

(1) 1 MΩ (2) 2 MΩ (3) 3 MΩ (4) 4 MΩ

72. Consider an amplifier with a voltage gain of −10 and a capacitance C = 10 pF connected between output and input terminals. Use Miller's theorem to find the equivalent capacitances at the output side.

(1) 11 pF (2) 110 pF (3) 10 pF (4) 100 pF

73. The cascode amplifier is composed of direct coupled :

(1) CE-CB configuration (2) CC-CC configuration

(3) CB-CE configuration (4) None

74. CMRR is more in :

(1) Single ended amplifier (2) Differential amplifier

(3) Inverting operational amplifier (4) None

75. Common mode rejection ratio is defined as ratio of :

(1) Common mode gain to differential mode gain

(2) Differential mode gain to common mode gain

(3) Common mode gain at input to differential mode gain at input

(4) Common mode gain at output to differential mode gain at output

76. Which of following configuration called as source follower ?

(1) Common Gate (2) Common Source

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77. Dynamic power of a CMOS VLSI circuit is linearly proportional to :

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78. Using 'Full-scaling' approach, the power dissipation of a transistor is scaled by a factor of :

(1) s (2) s^2 (3) s^3 (4) s^4

79. Dynamic power optimization technique primarily follows :

(1) Transistor sizing (2) Transistor stacking

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80. Which one of the following models is ***not*** related to low power design methodology ?

(1) Power consumption model (2) Current waveform model

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81. In 'clock gating' methodology, power can be reduced by :

(1) Reducing the effective frequency

(2) Reducing wasted operations

(3) Minimizing the power of each access

(4) None of the above

82. Using 'Alpha-power law model', the value of 'α' for 65–180 nm CMOS technology lies in the range of :

(1) 0.6 ~ 0.7 (2) 1.0 ~ 1.1 (3) 1.2 ~ 1.3 (4) 1.5 ~ 2.0

83. Using 'Monte Carlo Technique', one can choose N randomly distributed points x_1, x_2, x_3, ..., x_N in a multidimensional volume V to determine the integral of a function f. Then, the function f results in :

(1) $\int f dV \approx V < f > + \sqrt{\frac{< f^2 > - < f >}{N}}$

(2) $\int f dV \approx V < f > - \sqrt{\frac{< f^2 > - < f >}{N}}$

(3) $\int f dV \approx V < f > \pm \sqrt{\frac{< f^2 > - < f >}{N}}$

(4) $\int f dV \approx V < f > \mp \sqrt{\frac{< f^2 > - < f >}{N}}$

where $< f > \equiv \frac{1}{N} \sum_{i=1}^{N} f(x_i)$ and $< f^2 > \equiv \frac{1}{N} \sum_{i=1}^{N} f^2(x_i)$

84. Latches constructed with NOR and NAND gates tend to remain in the latched condition due to which configuration feature ?

(1) asynchronous operation (2) low input voltages

(3) gate impedance (4) cross coupling

85. Four J-K flip-flops are cascaded with their J-K inputs tied HIGH. If the input frequency (f_{in}) to the first flip-flop is 32 kHz, the output frequency (f_{out}) will be :

(1) 1 kHz (2) 2 kHz (3) 4 kHz (4) 16 kHz

86. Which type of analysis cannot be supported by SPICE ?

(1) non-linear d.c. (2) non-linear a.c.

(3) linear a.c. (4) temperature

87. How can you best use schematics to create a netlist which is easy to understand ?

(1) Allocate node numbers randomly.

(2) Use existing part numbers.

(3) Work through the circuit diagram adding the parts to the netlist as you encounter them.

(4) By annotating the schematic with our own practical node numbers that can then be used for the netlist.

88. In a synchronous circuit, positive clock skew occurs only when :

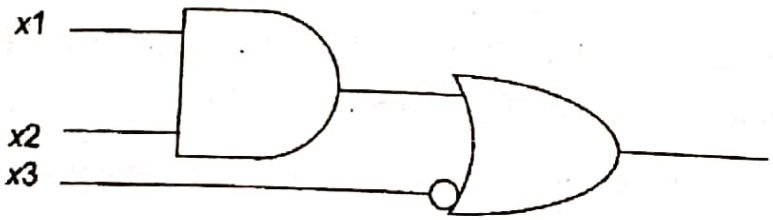
(1) the transmitting register receives the clock earlier than the receiving register

(2) the transmitting register receives the clock after the receiving register

(3) the receiving register gets the clock earlier than the sending register

(4) the receiving register gets the clock after the sending register

89. Calculate the signal probability for the following logic circuits with inputs x_1, x_2 and x_3 :



(1) 0.35 (2) 0.5 (3) 0.625 (4) 0.78

90. Double Gate MOSFETs are preferred over Single Gate MOSFETs due to :

(1) Easy fabrication

(2) Better control over channel

(3) Reduced Channel length

(4) Smaller size of Source/Drain

91. The far field of an antenna varies with distance r as :

(1) $1/r$ (2) $1/r^2$ (3) $1/r^3$ (4) $1/\sqrt{r}$

92. For the operation $21 + 13 = 40$ to be correct what will be the base of the number :

(1) 2 (2) 4 (3) 11 (4) 8

93. The number of distinct Boolean expressions of 3 variables is :

(1) 16 (2) 256 (3) 8 (4) 1024

94. Hexadecimal number '*A*' is equal to octal number :

(1) 16 (2) 12 (3) 8 (4) 10

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96. The Hamming distance between 010 and 001 is :

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97. ..... Satellite orbits in a circular pattern with an angular velocity equal to that of the earth.

(1) Geostationary (2) Early Bird I

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(1) Refractive index

(2) Magnetic permeability

(3) Speed of light × Magnetic permeability

(4) None

Total No. of Printed Pages : 21

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SET-Z

B

M.Phil./Ph.D./URS-EE-2020

SUBJECT : Electronics & Communication Engg.

10022

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

SEAL

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. Consider an Ideal voltage amplifier with a gain of 0.95 and a resistance R = 100 KΩ connected between output and input terminals. Use Miller's theorem to find the input resistance of this circuit :

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(1) Power consumption model

(2) Current waveform model

(3) Voltage-sensitive timing model

(4) None of the above

11. Which one of the following is ***not*** the advantage of ion-implantation over diffusion doping ?

(1) It is a low temperature process.

(2) Point imperfections are not produced.

(3) Shallow doping is possible.

(4) Gettering is possible.

12. Imperfection arising due to the displacement of an ion from a regular site to an interstitial site maintaining overall electrical neutrality of the ionic crystal is called :

(1) Frenkel imperfection

(2) Schottky imperfection

(3) Point imperfection

(4) Volume imperfection

13. Four probe method is used to measure :

(1) resistivity of semi-conducting material

(2) mobility of carriers

(3) carrier concentration

(4) none of the above

14. In photolithography, higher the radiation wavelength :

(1) smaller is the minimum feature size

(2) larger is the minimum feature size

(3) feature size is independent of it

(4) none of these

15. Hall effect can be used to measure :

(1) mobility of carriers (2) type of semiconductor

(3) carrier concentration (4) all of these

16. Etching is always anisotropic if the material is :

(1) Crystalline (2) Polycrystalline

(3) Amorphous (4) None of the above

17. The steady state conditions in diffusion are governed by :

(1) Fick's second law (2) Fick's first law

(3) Both (1) and (2) (4) Maxwell-Boltzmann's law

18. A heavily doped buried layer is used in bipolar IC technology to :

(1) bury the defects in Silicon below the active epitaxial layer

(2) reduce the resistance to current flow from the active layer to the substrate

(3) Prevent latchup

(4) reduce the collector resistance of the bipolar transistor

19. While diffusing an impurity into silicon, if the concentration of the impurity atoms is maintained constant at the surface of the wafer, then the diffused impurity profile is a :

(1) Gaussian (2) Exponential

(3) Quadratic (4) Complementary error function

20. If aluminum is deposited Upon a lightly doped n-region :

(1) A schottky diode is obtained

(2) An ohmic contact is obtained

(3) A constant capacitance is obtained

(4) A high valued constant resistance can be obtained

21. An AWGN is transmitting symbols at an SNR = 30 dB. The channel capacity per symbol in the channel is :

(1) 2 bits (2) 4 bits (3) 5 bits (4) 8 bits

22. AM signal is detected using an envelope detector. With carrier frequency set at 200 Mhz and modulating signal frequency being 20 kHz, the approximate value of time constant of envelope detector is :

(1) 5 ns (2) 60 μs (3) 70 μs (4) 2.5 ns

23. A sinusoidal signal with peak to peak voltage at 2 V is quantized into 128 levels using a midrise uniform quantizer. The quantization noise power is :

(1) 2 μW (2) 10 μW (3) 40 μW (4) 20 μW

24. In a FM system, a 10 MHz carrier is modulated by a sinusoidal signal of frequency 2 kHz. Using Carson's approximation bandwidth required is 0.1 MHz. If $y(t)$ = (modulated signal)^3. Thcn by using Carson's approximation, the bandwidth of $y(t)$ around 30 MHz is :

(1) 0.1 MHz (2) 0.2 MHz (3) 0.3 MHz (4) 0.5 MHz

25. The input to the matched filter is given by

$s(t) = 20\sin(2\pi \times 10^5 t)$ for $0 < t < 10^{-3}$ s

$= 0$ elsewhere

The peak amplitude of filter output is :

(1) 20 V (2) 2 V (3) 10 V (4) 0.2 V

26. Which of the following does ***not*** satisfy the wave equation ?

(1) $Ae^{j(wt-2z)}$ (2) $\cos(w(z+t))$

(3) $\cos x . \cos t$ (4) $\cos(y^3 + 5t)$

27. The electric field intensity vector of a plane wave is given by $E(r, t) = 10 \sin(6000t + 0.06x + 20a_y)$ where a_y denotes unit vector along y direction. The wave is propagating with a phase velocity of :

(1) 1×10^5 m/s (2) 1×10^6 m/s (3) -1×10^5 m/s (4) -1×10^6 m/s

28. If the length of the short-circuited transmission line is given as : $3/4.\lambda < l < \lambda/2$, then the input impedance is :

(1) Inductive

(2) Capacitive

(3) Zero

(4) Contains both real and imaginary parts

29. A quarter wave transformer matching a 50 Ohm source with a 200 Ohm load should have a characteristic impedance of :

(1) 50 Ohm (2) 100 Ohm (3) 150 Ohm (4) 200 Ohm

30. Match **A** (theorem) with **B** (description) :

	A		**B**
P.	curl $\vec{F} = 0$	1.	Gauss theorem
Q.	div $\vec{F} = 0$	2.	Irrotational
R.	$\iiint_V (\nabla . F) dV = \oiint_S F . dS$	3.	Solenoidal
S.	$\oiint_S F . dS = Q$	4.	Divergence theorem

(1) P - 2, Q - 3, R - 4, S - 1 (2) P - 3, Q - 2, R - 4, S - 1

(3) P - 2, Q - 3, R - 1, S - 4 (4) P - 2, Q - 4, R - 3, S - 1

31. For a silicon p + n junction diode the doping concentrations are $N_a = 10^{15}\,cm^{-3}$ and $N_d = 10^{10}\,cm^{-3}$. The minority carrier hole diffusion coefficient is $D_p = 10\ cm^2/s$ and the minority carrier hole life time is $\tau_{p0} = 10^{-5}$ s. The cross sectional area is $A = 10^{-4}\,cm^2$. The reverse saturation current is ($n_i = 1.5 \times 10^{-10}/cm^3$) :

(1) 36×10^{-12} A (2) 3.6×10^{-12} A

(3) 36×10^{-10} A (4) 3.6×10^{-10} A

32. Match A (equations) with B (relations) :

A		B	
P.	Continuity Equation	1.	Relates diffusion constant with mobility
Q.	Einstein's Equation	2.	Relates charge density with electric field
R.	Poisson's Equation	3.	Concentration gradient
S.	Diffusion Current	4.	Rate of charge of minority carrier density with time

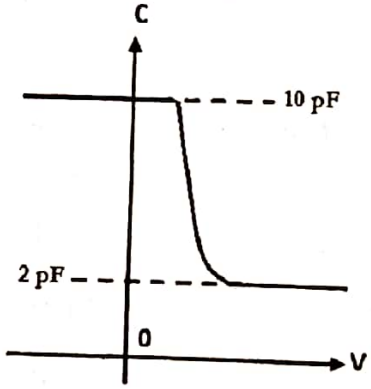
(1) P - 4, Q - 1, R - 3, S - 2 (2) P - 4, Q - 1, R - 2, S - 3

(3) P - 1, Q - 4, R - 2, S - 3 (4) P - 1, Q - 4, R - 3, S - 2

33. A Ge diode has a saturation current of 10 μA at room temperature. Then, the reverse current at T = 350° K is :

(1) 32 mA (2) 8.42 mA (3) 0.32 mA (4) 3.2 μA

34. The figure shows the high-frequency capacitance-voltage characteristics of a MOS capacitor. Assume that the permittivities of silicon and SiO_2 are 1×10^{-12} F/cm and 3.5×10^{-13} F/cm respectively. Calculate the capacitance in depletion mode.



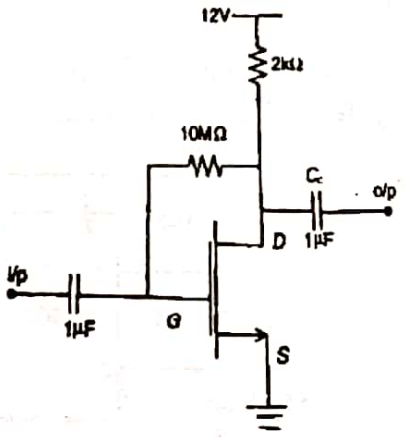
(1) 12 pF (2) 5 pF (3) 1.5 pF (4) 2.5 pF

35. If P is passivation, Q is n-well implant, R is metallization and S is source/drain diffusion, then the order in which they are carried out in a standard n-well CMOS fabrication process is :

(1) S – R – Q – P (2) R – P – S – Q

(3) Q – S – R – P (4) P – Q – R – S

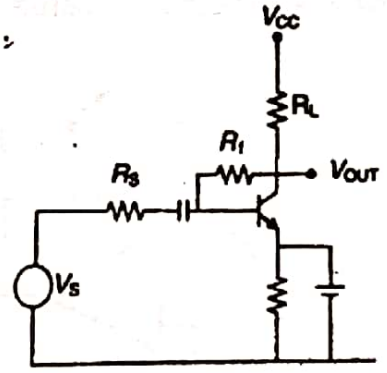
36. In the circuit given below, the parameters are $K = 0.2 \times 10^{-3} A/V^2$, $V_T = 3v$, $Y_d = 20$ μS, $V_{GSQ} = 6.4\ V$, $I_{DQ} = 2.75$ mA. The output impedance z_0 and gain A_V is :



(1) 19.23 kΩ, –3.14 (2) 1.923 kΩ, 3.14

(3) 1.923 kΩ, –3.14 (4) 12.93 kΩ, –31.4

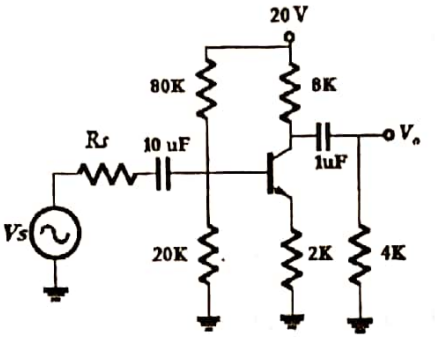
37. The type of feedback in the given circuit is :



(1) Voltage shunt (2) Current shunt

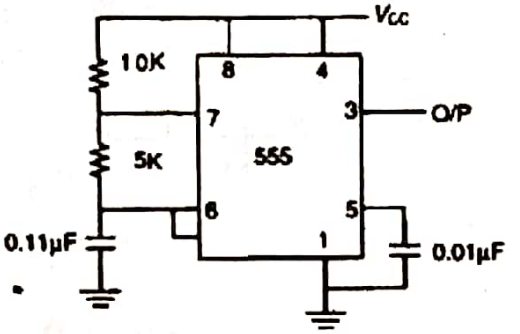
(3) Voltage series (4) Current series

38. The gain A_V of the circuit shown below is :



(1) −169 (2) −183 (3) −160 (4) −16.9

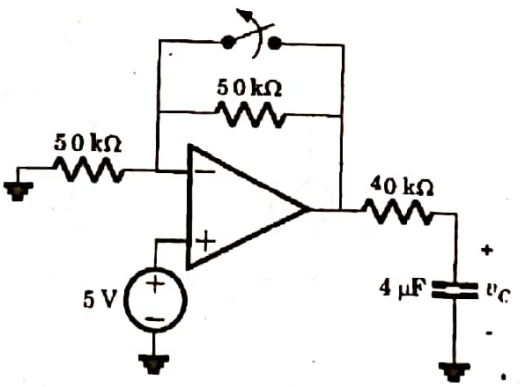
39. The 555 timer circuit as shown in figure generates a rectangular waveform. The frequency and duty cycle of the waveform are :



(1) 660 Hz, 0.45 (2) 660 Hz, 0.25

(3) 66 Hz, 0.25 (4) 6.6 Hz, 0.25

40. The circuit shown below is at steady state before the switch opens at $t = 0$. The $v_c(t)$ for $t > 0$ is :



(1) $10 - 5e^{-6.25t}$ V (2) $5 + 5e^{-6.25t}$ V

(3) $5 + 5e^{-t/6.25}$ V (4) $10 - 5e^{-t/6.25}$ V

41. The far field of an antenna varies with distance r as :

(1) $1/r$ (2) $1/r^2$ (3) $1/r^3$ (4) $1/\sqrt{r}$

42. For the operation 21 + 13 = 40 to be correct what will be the base of the number :

(1) 2 (2) 4 (3) 11 (4) 8

43. The number of distinct Boolean expressions of 3 variables is :

(1) 16 (2) 256 (3) 8 (4) 1024

44. Hexadecimal number '*A*' is equal to octal number :

(1) 16 (2) 12 (3) 8 (4) 10

45. The number of bits in ASCII is :

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46. The Hamming distance between 010 and 001 is :

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(1) MSC (2) Roaming

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49. For maximum radio coverage shape of the cellular region should be :

(1) Circular (2) Hexagon

(3) Square (4) Oval

50. Electrical permittivity of materials is approximately equal to square of :

(1) Refractive index

(2) Magnetic permeability

(3) Speed of light × Magnetic permeability

(4) None

51. The threshold voltage of an *n*-channel MOSFET can be increased by :

(1) Increasing the channel dopant concentration

(2) Reducing the channel dopant concentration

(3) Reducing the gate oxide thickness

(4) Reducing the channel length

52. In modern technology, the gate material used for a MOSFET is :

(1) Heavily doped polycrystalline silicon

(2) Pure silicon

(3) High purity silica oxide

(4) Epitaxial grown silicon

53. A certain gate draws 1.8μA when its output is HIGH and 3.3μA when its output is LOW. V_{CC} is 5V and the gate is operated on a 50% duty cycle. The average power dissipation (P_D) is :

(1) 2.55 μW (2) 1.27 μW (3) 12.75 μW (4) 5 μW

54. In BiCMOS circuits :

(1) CMOS is used for implementing logic and BJT is used for high drive current

(2) BJT is used for implementing logic and CMOS is used for high drive current

(3) CMOS is used for implementing logic and BJT is used for low power

(4) CMOS is used for high speed and BJT is used for high drive current

55. Propagation delay of a cell primarily depends on :

(1) Output transition and input load

(2) Input transition and output load

(3) Input transition and output transition

(4) Input load and output load

56. If metal 6 and metal 7 are used for the power in 7 metal layer process design then which metals you will use for clock ?

(1) Metal 1 and metal 2 (2) Metal 3 and metal 4

(3) Metal 4 and metal 5 (4) Metal 6 and metal 7

57. Emitter-coupled logic (ECL) is the fastest bipolar transistor logic because :

(1) it uses current, rather than voltages, as the output variables

(2) it uses a circuit configuration that prevents the transistors from going into saturation

(3) it has no p-n-p transistors

(4) it uses differential inputs

58. A Schmitt trigger circuit achieves hysteresis by utilizing :

(1) the magnetic properties of a transformer code

(2) avalanche multiplication in a zener (tunnel) diode

(3) the Barkhausen principle

(4) regenerative positive feedback

59. When a step input is applied to an inverter made with an n-p-n transistor, such that the transistor goes from cutoff to saturation, there is a delay time (t_d) before the output goes low. The delay time is due partly to :

(1) the stored minority carrier charge in the base

(2) the charging of the base-collector junction capacitance

(3) the charging of the base-emitter junction capacitance

(4) the discharging of the minority carrier stored charge in the collector

60. Which equation related to noise margins is ***correct*** ?

(1) $V_{NL} = V_{IL(\max)} + V_{OL(\max)}$ (2) $V_{NH} = V_{OH(\min)} + V_{IH(\min)}$

(3) $V_{NL} = V_{OH(\min)} - V_{IH(\min)}$ (4) $V_{NH} = V_{OH(\min)} - V_{IH(\min)}$

61. In 'clock gating' methodology, power can be reduced by :

(1) Reducing the effective frequency

(2) Reducing wasted operations

(3) Minimizing the power of each access

(4) None of the above

62. Using 'Alpha-power law model', the value of 'α' for 65–180 nm CMOS technology lies in the range of :

(1) 0.6 ~ 0.7 (2) 1.0 ~ 1.1 (3) 1.2 ~ 1.3 (4) 1.5 ~ 2.0

63. Using 'Monte Carlo Technique', one can choose N randomly distributed points x_1, x_2, x_3, ..., x_N in a multidimensional volume V to determine the integral of a function f. Then, the function f results in :

(1) $\int f dV \approx V < f > + \sqrt{\frac{< f^2 > - < f >}{N}}$

(2) $\int f dV \approx V < f > - \sqrt{\frac{< f^2 > - < f >}{N}}$

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where $< f > \equiv \frac{1}{N} \sum_{i=1}^{N} f(x_i)$ and $< f^2 > \equiv \frac{1}{N} \sum_{i=1}^{N} f^2(x_i)$

64. Latches constructed with NOR and NAND gates tend to remain in the latched condition due to which configuration feature ?

(1) asynchronous operation
(2) low input voltages
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(3) linear a.c.
(4) temperature

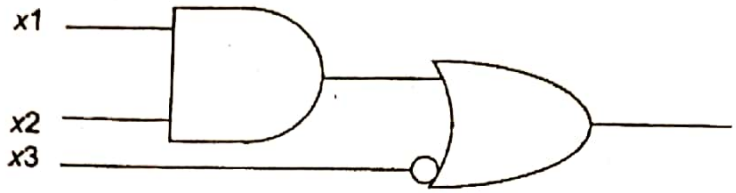
67. How can you best use schematics to create a netlist which is easy to understand ?

(1) Allocate node numbers randomly.
(2) Use existing part numbers.
(3) Work through the circuit diagram adding the parts to the netlist as you encounter them.
(4) By annotating the schematic with our own practical node numbers that can then be used for the netlist.

68. In a synchronous circuit, positive clock skew occurs only when :

(1) the transmitting register receives the clock earlier than the receiving register
(2) the transmitting register receives the clock after the receiving register
(3) the receiving register gets the clock earlier than the sending register
(4) the receiving register gets the clock after the sending register

69. Calculate the signal probability for the following logic circuits with inputs x_1, x_2 and x_3 :



(1) 0.35 (2) 0.5 (3) 0.625 (4) 0.78

70. Double Gate MOSFETs are preferred over Single Gate MOSFETs due to :

(1) Easy fabrication (2) Better control over channel

(3) Reduced Channel length (4) Smaller size of Source/Drain

71. The Fermi level of a metal is the :

(1) Energy at which the probability of finding an electron is 1/2.

(2) The highest energy an electron can possess inside the metal.

(3) The energy required to take an electron from metal to vacuum.

(4) The lowest energy an electron possess at 0K.

72. In a semiconductor, the probability of finding an electron at an energy ΔE above the bottom of the conduction band is always ..... the probability of finding a hole at an energy ΔE below the top of the valence band.

(1) greater than (2) equal to

(3) less than (4) unequal to

73. In the piecewise linear diode model, the diode resistance is :

(1) low for all biases

(2) high for all biases

(3) low for biases greater than cut-in voltage and high for biases less than cut-in voltage

(4) high for biases greater than cut-in voltage and low for biases less than cut-in voltage

74. In the triode region, the $I_D - V_{DS}$ characteristics of a MOSFET are :

(1) hyperbolic (2) linear (3) quadratic (4) exponential

75. In the common emitter configuration, if the transistor is in the saturation region, then :

(1) $I_C > I_E$ (2) $I_C < \beta I_B$ (3) $I_E < I_B$ (4) $I_B > \beta I_C$

76. The LEVEL 1 SPICE model implements :

(1) Square Law model
(2) Alpha Power Law model
(3) Injection Velocity model
(4) Velocity Saturation model

77. BSIM 1 is a :

(1) Charge based model
(2) Threshold voltage based model
(3) Surface potential based model
(4) None of the above

78. PSP is a :

(1) Charge based model
(2) Threshold voltage based model
(3) Surface potential based model
(4) None of the above

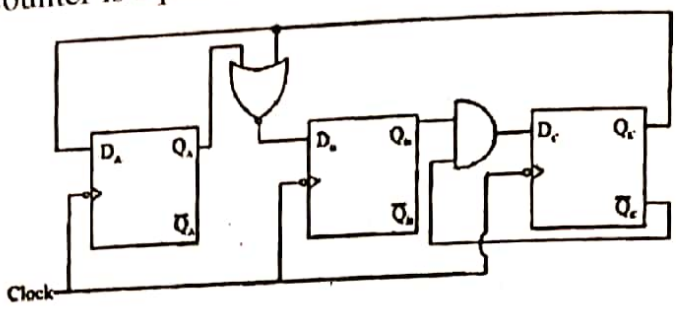
79. EKV is a :

(1) Charge based model
(2) Threshold voltage based model
(3) Surface potential based model
(4) None of the above

80. BSIM4 model considers the influence of narrow width effect (NWE) on :

(1) Mobility only
(2) Threshold voltage only
(3) Saturation velocity only
(4) All of the above

81. If all flip-flops are reset to '0' at power on, then the total number of output states (ABC) represented by this counter is equal to :



(1) 3 (2) 5 (3) 4 (4) 7

82. Given $F = F_1.F_2$, where $F(A, B, C, D) = \Sigma m\ (4, 7, 15)$, $F_1(A, B, C, D) = \Sigma m\ (0, 1, 2, 3, 4, 7, 8, 9, 10, 11, 15)$, the possible function for F_2 is :

(1) $\Sigma m\ (5, 6, 12, 13, 14)$ (2) $\Sigma m\ (4, 5, 6, 7, 8, 12, 13, 14, 15)$

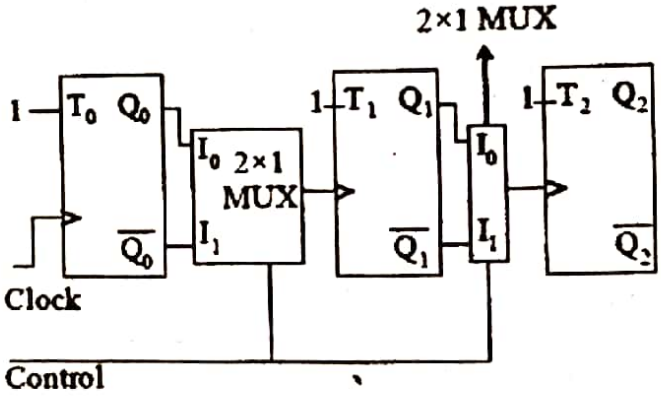
(3) $\Sigma m\ (5, 6, 12, 13, 4, 7, 15)$ (4) None of these

83. 1000 H : LXI SP, 0FFFH
CALL 2050H
After call, content of PC and SP is :

(1) PC = 1006 H, SP = 0FFFH (2) PC = 2050 H, SP = 0FFFH

(3) PC = 2050 H, SP = 0FFDH (4) PC = 1006 H, SP = 0FFDH

84. For the given sequential circuit, which of the following statements are true :



a. For control = 0 it will acts as down counter

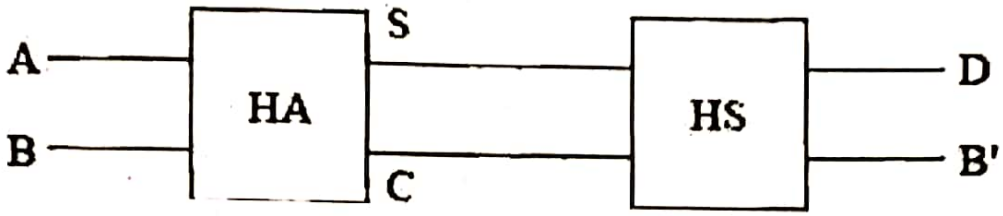
b. For control = 1 it will acts at up counter

c. Synchronous counter

d. Asynchronous counter

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

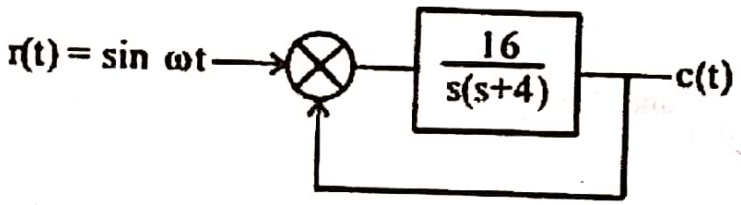
85. The half adders and half substractor are connected as shown in figure below. The output D and B' are :



(1) $D = A \oplus B;\ B' = AB$ (2) $D = A + B;\ B' = 0$

(3) $D = AB;\ B' = 0$ (4) $D = A + B;\ B' = AB$

86. In the system shown below, the steady state response c(t) will exhibit a resonant peak at a frequency of ..... rad/sec. (rounding up to 2 decimals)



(1) $2\sqrt{2}$ (2) $4\sqrt{2}$ (3) $6\sqrt{2}$ (4) $8\sqrt{2}$

87. TF of a unity feedback system is $\frac{1}{(4s^2 + s + 4)}$. The magnitude of the system at 0.1591 Hz is approximately ..... dB.

(1) 0 (2) 1 (3) 2 (4) 3

88. By performing cascading / summing / differencing operations using transfer function blocks $G_1(s)$ and $G_2(S)$ one cannot realize a transfer function of the form :

(1) $G_1(S)\ G_2(S)$ (2) $\frac{G_1(S)}{G_2(S)}$

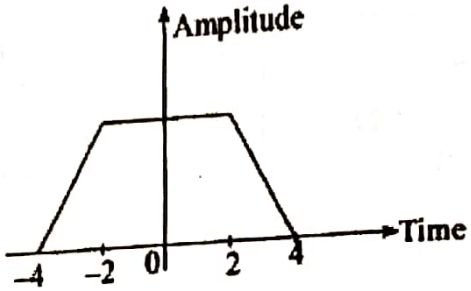
(3) $G_2(S)\left(\frac{1}{G_1(S)} + G_2(S)\right)$ (4) $G_1(S)\left(\frac{1}{G_1(S)} - G_2(S)\right)$

89. The impulse response of a discrete LTI system is given by $h(n) = -(0.25)^{-n}\, u\,(n-4)$. The system is :

(1) Causal and stable (2) Causal and unstable

(3) Non causal and stable (4) Non-causal and unstable

90. The graph shown below represents a wave form obtained by convolving two rectangular waveform of duration :



(1) 4 units each

(2) 4 and 2 units respectively

(3) 6 and 3 units respectively

(4) 6 and 2 units respectively

91. Given that :

$$A=\begin{bmatrix}-5 & -3\\ 2 & 0\end{bmatrix} \text{ and } I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

The, the value of A^3 is :

(1) $15A + 12I$

(2) $19A + 30I$

(3) $17A + 15I$

(4) $17A + 21I$

92. A fair coin is tossed 10 times. What is the probability that only the first two tosses will yield heads ?

(1) $\left(\frac{1}{2}\right)^2$

(2) ${}^{10}C_2\left(\frac{1}{2}\right)^2$

(3) $\left(\frac{1}{2}\right)^{10}$

(4) ${}^{10}C_2\left(\frac{1}{2}\right)^{10}$

93. $I=\int_0^1 x^5\sqrt{(1-x^2)^5}\,.\,dx =$

(1) $\frac{8}{693}$

(2) $\frac{5}{317}$

(3) $\frac{8}{315}$

(4) $\frac{41}{720}$

94. Match the following and choose the correct combination :

Group-1	Group-2
A. Newton-Raphson method	1. Solving non-linear equations
B. Runge-Kutta method	2. Solving linear simultaneous equations
C. Simpson's rule	3. Solving ordinary differential equations
D. Gauss elimination	4. Numerical integration
	5. Interpolation
	6. Calculation of eigen values

(1) A - 6, B - 1, C - 5, D - 3

(2) A - 1, B - 6, C - 4, D - 3

(3) A - 1, B - 3, C - 4, D - 2

(4) A - 5, B - 3, C - 4, D - 1

95. The length of arc of the curve $x = t^2$, $y = t^2$ from $t = 0$ to $t = 4$ is :

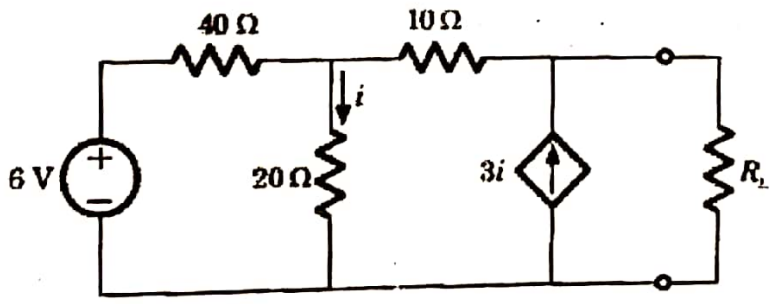
(1) $\frac{8}{27}\left(37\sqrt{37} - 1\right)$

(2) $\frac{3}{5}\left(\sqrt{2} - 1\right)$

(3) $\frac{5}{21}$

(4) $\frac{5-\sqrt{3}}{2}$

96. In the circuit given below, the R_L will absorb maximum power if R_L is equal to :



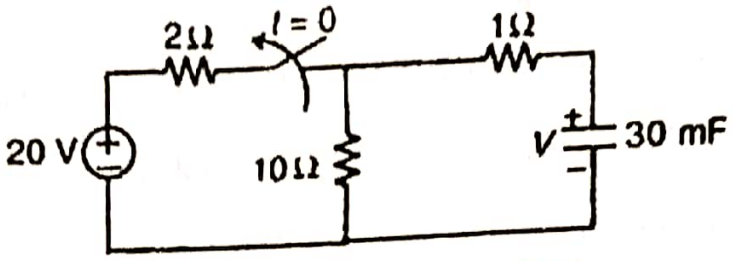
(1) 40/3 Ohm

(2) 60/3 Ohm

(3) 70/3 Ohm

(4) 20/3 Ohm

97. In the circuit given below the switch is opened at $t = 0$ after long time. The voltage $v(t)$ for $t \geq 0$ is :



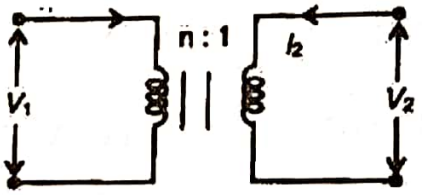
(1) $50/3\, e^{(-t/0.33)}$ V

(2) $15/3\, e^{(-t/0.33)}$ V

(3) $50/3\, e^{(-t/30)}$ V

(4) $50/3\, e^{(-0.33t)}$ V

98. From the *ABCD* parameters of an ideal n : 1 transformer shown in figure below, the value of *D* is :



(1) n (2) $1/n$ (3) n^2 (4) $1/n^2$

99. Fourier transform of the signal $u(t)$ is given by :

(1) 1

(2) $\pi\delta(\omega) - 1/j\omega$

(3) $2\pi\delta(\omega)$

(4) $\pi\delta(\omega) - j/\omega$

100. A series resonant circuit has L = 20 mH and C = 10 mF. The required R for the bandwidth of 50 Hz is :

(1) 16 Ohm (2) 1 Ohm (3) 0.1 Ohm (4) 10 Ohm

Total No. of Printed Pages : 21

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C

SET-Z

M.Phil./Ph.D./URS-EE-2020

SUBJECT : Electronics & Communication Engg.

Sr. No. .....10003.....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. The Fermi level of a metal is the :

   (1) Energy at which the probability of finding an electron is 1/2.

   (2) The highest energy an electron can possess inside the metal.

   (3) The energy required to take an electron from metal to vacuum.

   (4) The lowest energy an electron possess at 0K.

2. In a semiconductor, the probability of finding an electron at an energy ΔE above the bottom of the conduction band is always ..... the probability of finding a hole at an energy ΔE below the top of the valence band.

   (1) greater than (2) equal to

   (3) less than (4) unequal to

3. In the piecewise linear diode model, the diode resistance is :

   (1) low for all biases

   (2) high for all biases

   (3) low for biases greater than cut-in voltage and high for biases less than cut-in voltage

   (4) high for biases greater than cut-in voltage and low for biases less than cut-in voltage

4. In the triode region, the $I_D - V_{DS}$ characteristics of a MOSFET are :

   (1) hyperbolic (2) linear (3) quadratic (4) exponential

5. In the common emitter configuration, if the transistor is in the saturation region, then :

   (1) $I_C > I_E$ (2) $I_C < \beta I_B$ (3) $I_E < I_B$ (4) $I_B > \beta I_C$

6. The LEVEL 1 SPICE model implements :

   (1) Square Law model (2) Alpha Power Law model

   (3) Injection Velocity model (4) Velocity Saturation model

7. BSIM 1 is a :

(1) Charge based model

(2) Threshold voltage based model

(3) Surface potential based model

(4) None of the above

8. PSP is a :

(1) Charge based model

(2) Threshold voltage based model

(3) Surface potential based model

(4) None of the above

9. EKV is a :

(1) Charge based model

(2) Threshold voltage based model

(3) Surface potential based model

(4) None of the above

10. BSIM4 model considers the influence of narrow width effect (NWE) on :

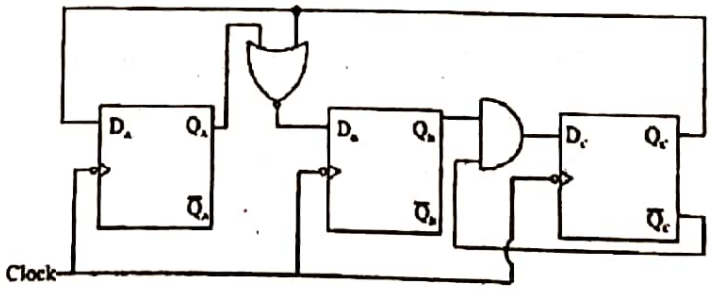
(1) Mobility only

(2) Threshold voltage only

(3) Saturation velocity only

(4) All of the above

11. If all flip-flops are reset to '0' at power on, then the total number of output states (*ABC*) represented by this counter is equal to :



(1) 3

(2) 5

(3) 4

(4) 7

12. Given $F = F_1.F_2$, where $F(A, B, C, D) = \Sigma m\ (4, 7, 15)$, $F_1(A, B, C, D) = \Sigma m\ (0, 1, 2, 3, 4, 7, 8, 9, 10, 11, 15)$, the possible function for F_2 is :

(1) $\Sigma m\ (5, 6, 12, 13, 14)$ (2) $\Sigma m\ (4, 5, 6, 7, 8, 12, 13, 14, 15)$

(3) $\Sigma m\ (5, 6, 12, 13, 4, 7, 15)$ (4) None of these

13. 1000 H : LXI SP, 0FFFH

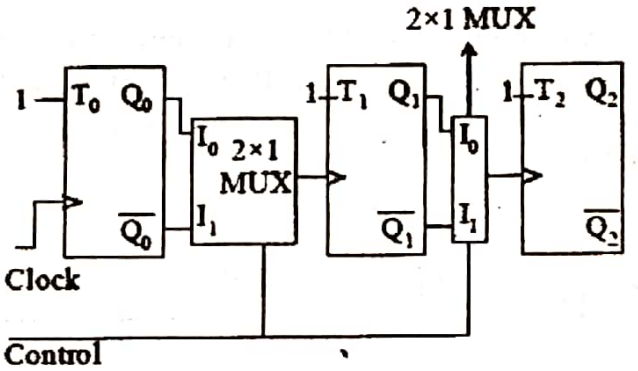
CALL 2050H

After call, content of PC and SP is :

(1) PC = 1006 H, SP = 0FFFH (2) PC = 2050 H, SP = 0FFFH

(3) PC = 2050 H, SP = 0FFDH (4) PC = 1006 H, SP = 0FFDH

14. For the given sequential circuit, which of the following statements are true :



a. For control = 0 it will acts as down counter

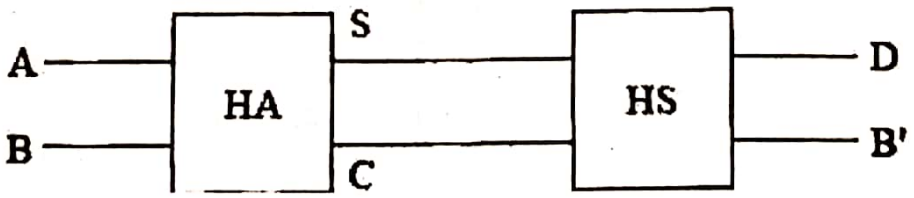
b. For control = 1 it will acts at up counter

c. Synchronous counter

d. Asynchronous counter

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

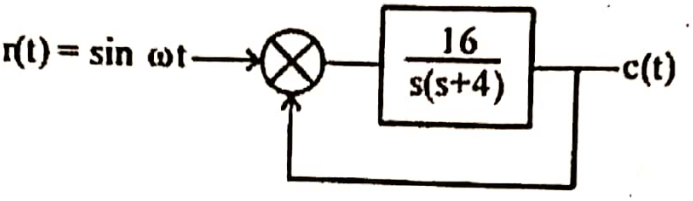
15. The half adders and half substractor are connected as shown in figure below. The output D and B' are :



(1) $D = A \oplus B;\ B' = AB$ (2) $D = A + B;\ B' = 0$

(3) $D = AB;\ B' = 0$ (4) $D = A + B;\ B' = AB$

16. In the system shown below, the steady state response c(t) will exhibit a resonant peak at a frequency of ..... rad/sec. (rounding up to 2 decimals)



(1) $2\sqrt{2}$ (2) $4\sqrt{2}$ (3) $6\sqrt{2}$ (4) $8\sqrt{2}$

17. TF of a unity feedback system is $\frac{1}{(4s^2+s+4)}$. The magnitude of the system at 0.1591 Hz is approximately ..... dB.

(1) 0 (2) 1 (3) 2 (4) 3

18. By performing cascading / summing / differencing operations using transfer function blocks $G_1(s)$ and $G_2(S)$ one cannot realize a transfer function of the form :

(1) $G_1(S)\ G_2(S)$ (2) $\frac{G_1(S)}{G_2(S)}$

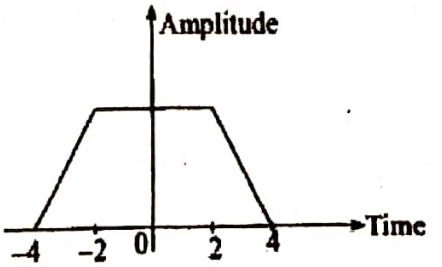
(3) $G_2(S)\left(\frac{1}{G_1(S)}+G_2(S)\right)$ (4) $G_1(S)\left(\frac{1}{G_1(S)}-G_2(S)\right)$

19. The impulse response of a discrete LTI system is given by $h(n) = -(0.25)^{-n}\,u\,(n-4)$. The system is :

(1) Causal and stable (2) Causal and unstable

(3) Non causal and stable (4) Non-causal and unstable

20. The graph shown below represents a wave form obtained by convolving two rectangular waveform of duration :



(1) 4 units each (2) 4 and 2 units respectively

(3) 6 and 3 units respectively (4) 6 and 2 units respectively

21. Given that :

$$A=\begin{bmatrix}-5 & -3\\ 2 & 0\end{bmatrix} \text{ and } I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

The, the value of A^3 is :

(1) $15A + 12I$ (2) $19A + 30I$

(3) $17A + 15I$ (4) $17A + 21I$

22. A fair coin is tossed 10 times. What is the probability that only the first two tosses will yield heads ?

(1) $\left(\frac{1}{2}\right)^2$ (2) ${}^{10}C_2\left(\frac{1}{2}\right)^2$

(3) $\left(\frac{1}{2}\right)^{10}$ (4) ${}^{10}C_2\left(\frac{1}{2}\right)^{10}$

23. $I=\int_0^1 x^5\sqrt{(1-x^2)^5}\,.dx =$

(1) $\frac{8}{693}$ (2) $\frac{5}{317}$ (3) $\frac{8}{315}$ (4) $\frac{41}{720}$

24. Match the following and choose the correct combination :

Group-1		Group-2	
A.	Newton-Raphson method	1.	Solving non-linear equations
B.	Runge-Kutta method	2.	Solving linear simultaneous equations
C.	Simpson's rule	3.	Solving ordinary differential equations
D.	Gauss elimination	4.	Numerical integration
		5.	Interpolation
		6.	Calculation of eigen values

(1) A - 6, B - 1, C - 5, D - 3 (2) A - 1, B - 6, C - 4, D - 3

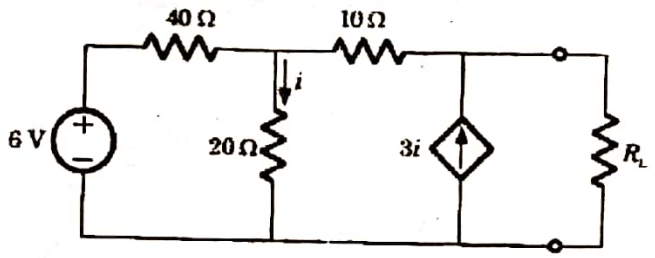
(3) A - 1, B - 3, C - 4, D - 2 (4) A - 5, B - 3, C - 4, D - 1

25. The length of arc of the curve $x = t^2$, $y = t^2$ from $t = 0$ to $t = 4$ is :

(1) $\frac{8}{27}\left(37\sqrt{37}-1\right)$ (2) $\frac{3}{5}\left(\sqrt{2}-1\right)$

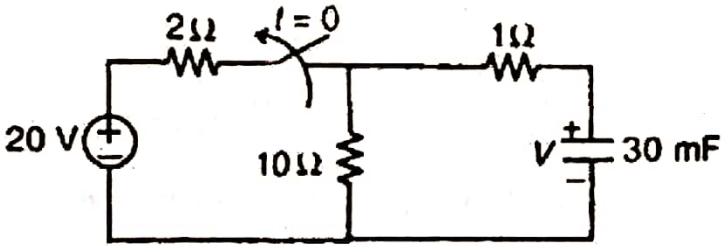
(3) $\frac{5}{21}$ (4) $\frac{5-\sqrt{3}}{2}$

26. In the circuit given below, the R_L will absorb maximum power if R_L is equal to :



(1) 40/3 Ohm (2) 60/3 Ohm (3) 70/3 Ohm (4) 20/3 Ohm

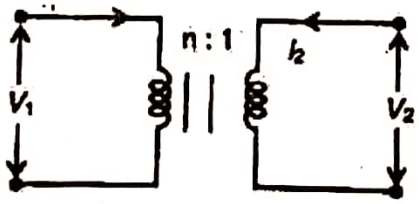
27. In the circuit given below the switch is opened at $t = 0$ after long time. The voltage $v(t)$ for $t \geq 0$ is :



(1) $50/3\, e^{(-t/0.33)}$ V (2) $15/3\, e^{(-t/0.33)}$ V

(3) $50/3\, e^{(-t/30)}$ V (4) $50/3\, e^{(-0.33t)}$ V

28. From the *ABCD* parameters of an ideal n : 1 transformer shown in figure below, the value of *D* is :



(1) n (2) $1/n$ (3) n^2 (4) $1/n^2$

29. Fourier transform of the signal $u(t)$ is given by :

(1) 1 (2) $\pi\delta(\omega) - 1/j\omega$

(3) $2\pi\delta(\omega)$ (4) $\pi\delta(\omega) - j/\omega$

30. A series resonant circuit has L = 20 mH and C = 10 mF. The required R for the bandwidth of 50 Hz is :

(1) 16 Ohm (2) 1 Ohm (3) 0.1 Ohm (4) 10 Ohm

31. In 'clock gating' methodology, power can be reduced by :

(1) Reducing the effective frequency

(2) Reducing wasted operations

(3) Minimizing the power of each access

(4) None of the above

32. Using 'Alpha-power law model', the value of 'α' for 65–180 nm CMOS technology lies in the range of :

(1) 0.6 ~ 0.7 (2) 1.0 ~ 1.1 (3) 1.2 ~ 1.3 (4) 1.5 ~ 2.0

33. Using 'Monte Carlo Technique', one can choose N randomly distributed points x_1, x_2, x_3, ..., x_N in a multidimensional volume V to determine the integral of a function f. Then, the function f results in :

(1) $\int f dV \approx V < f > + \sqrt{\frac{< f^2 > - < f >}{N}}$

(2) $\int f dV \approx V < f > - \sqrt{\frac{< f^2 > - < f >}{N}}$

(3) $\int f dV \approx V < f > \pm \sqrt{\frac{< f^2 > - < f >}{N}}$

(4) $\int f dV \approx V < f > \mp \sqrt{\frac{< f^2 > - < f >}{N}}$

where $< f > \equiv \frac{1}{N}\sum_{i=1}^{N} f(x_i)$ and $< f^2 > \equiv \frac{1}{N}\sum_{i=1}^{N} f^2(x_i)$

34. Latches constructed with NOR and NAND gates tend to remain in the latched condition due to which configuration feature ?

(1) asynchronous operation
(2) low input voltages
(3) gate impedance
(4) cross coupling

35. Four J-K flip-flops are cascaded with their J-K inputs tied HIGH. If the input frequency (f_{in}) to the first flip-flop is 32 kHz, the output frequency (f_{out}) will be :

(1) 1 kHz (2) 2 kHz (3) 4 kHz (4) 16 kHz

36. Which type of analysis cannot be supported by SPICE ?

(1) non-linear d.c.
(2) non-linear a.c.
(3) linear a.c.
(4) temperature

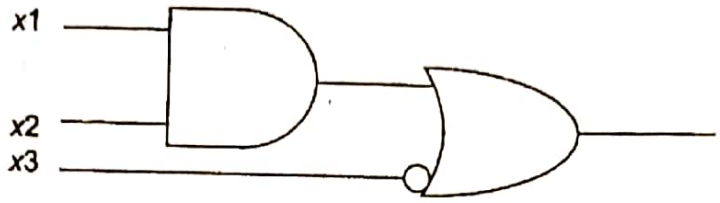
37. How can you best use schematics to create a netlist which is easy to understand ?

(1) Allocate node numbers randomly.
(2) Use existing part numbers.
(3) Work through the circuit diagram adding the parts to the netlist as you encounter them.
(4) By annotating the schematic with our own practical node numbers that can then be used for the netlist.

38. In a synchronous circuit, positive clock skew occurs only when :

(1) the transmitting register receives the clock earlier than the receiving register
(2) the transmitting register receives the clock after the receiving register
(3) the receiving register gets the clock earlier than the sending register
(4) the receiving register gets the clock after the sending register

39. Calculate the signal probability for the following logic circuits with inputs x_1, x_2 and x_3 :



(1) 0.35 (2) 0.5 (3) 0.625 (4) 0.78

40. Double Gate MOSFETs are preferred over Single Gate MOSFETs due to :

(1) Easy fabrication

(2) Better control over channel

(3) Reduced Channel length

(4) Smaller size of Source/Drain

41. The threshold voltage of an *n*-channel MOSFET can be increased by :

(1) Increasing the channel dopant concentration

(2) Reducing the channel dopant concentration

(3) Reducing the gate oxide thickness

(4) Reducing the channel length

42. In modern technology, the gate material used for a MOSFET is :

(1) Heavily doped polycrystalline silicon

(2) Pure silicon

(3) High purity silica oxide

(4) Epitaxial grown silicon

43. A certain gate draws 1.8μA when its output is HIGH and 3.3μA when its output is LOW. V_{CC} is 5V and the gate is operated on a 50% duty cycle. The average power dissipation (P_D) is :

(1) 2.55 μW (2) 1.27 μW (3) 12.75 μW (4) 5 μW

44. In BiCMOS circuits :
(1) CMOS is used for implementing logic and BJT is used for high drive current
(2) BJT is used for implementing logic and CMOS is used for high drive current
(3) CMOS is used for implementing logic and BJT is used for low power
(4) CMOS is used for high speed and BJT is used for high drive current

45. Propagation delay of a cell primarily depends on :
(1) Output transition and input load
(2) Input transition and output load
(3) Input transition and output transition
(4) Input load and output load

46. If metal 6 and metal 7 are used for the power in 7 metal layer process design then which metals you will use for clock ?
(1) Metal 1 and metal 2
(2) Metal 3 and metal 4
(3) Metal 4 and metal 5
(4) Metal 6 and metal 7

47. Emitter-coupled logic (ECL) is the fastest bipolar transistor logic because :
(1) it uses current, rather than voltages, as the output variables
(2) it uses a circuit configuration that prevents the transistors from going into saturation
(3) it has no p-n-p transistors
(4) it uses differential inputs

48. A Schmitt trigger circuit achieves hysteresis by utilizing :
(1) the magnetic properties of a transformer code
(2) avalanche multiplication in a zener (tunnel) diode
(3) the Barkhausen principle
(4) regenerative positive feedback

49. When a step input is applied to an inverter made with an n-p-n transistor, such that the transistor goes from cutoff to saturation, there is a delay time (t_d) before the output goes low. The delay time is due partly to :

(1) the stored minority carrier charge in the base

(2) the charging of the base-collector junction capacitance

(3) the charging of the base-emitter junction capacitance

(4) the discharging of the minority carrier stored charge in the collector

50. Which equation related to noise margins is ***correct*** ?

(1) $V_{NL} = V_{IL(\max)} + V_{OL(\max)}$ (2) $V_{NH} = V_{OH(\min)} + V_{IH(\min)}$

(3) $V_{NL} = V_{OH(\min)} - V_{IH(\min)}$ (4) $V_{NH} = V_{OH(\min)} - V_{IH(\min)}$

51. An AWGN is transmitting symbols at an SNR = 30 dB. The channel capacity per symbol in the channel is :

(1) 2 bits (2) 4 bits (3) 5 bits (4) 8 bits

52. AM signal is detected using an envelope detector. With carrier frequency set at 200 Mhz and modulating signal frequency being 20 kHz, the approximate value of time constant of envelope detector is :

(1) 5 ns (2) 60 µs (3) 70 µs (4) 2.5 ns

53. A sinusoidal signal with peak to peak voltage at 2 V is quantized into 128 levels using a midrise uniform quantizer. The quantization noise power is :

(1) 2 µW (2) 10 µW (3) 40 µW (4) 20 µW

54. In a FM system, a 10 MHz carrier is modulated by a sinusoidal signal of frequency 2 kHz. Using Carson's approximation bandwidth required is 0.1 MHz. If $y(t)$ = (modulated signal)^3. Thcn by using Carson's approximation, the bandwidth of $y(t)$ around 30 MHz is :

(1) 0.1 MHz (2) 0.2 MHz (3) 0.3 MHz (4) 0.5 MHz

55. The input to the matched filter is given by

$s(t) = 20\sin(2\pi \times 10^5 t)$ for $0 < t < 10^{-3}$ s

$= 0$ elsewhere

The peak amplitude of filter output is :

(1) 20 V (2) 2 V (3) 10 V (4) 0.2 V

56. Which of the following does ***not*** satisfy the wave equation ?

(1) $Ae^{j(wt-2z)}$ (2) $\cos(w(z+t))$

(3) $\cos x . \cos t$ (4) $\cos(y^3 + 5t)$

57. The electric field intensity vector of a plane wave is given by $E(r, t) = 10 \sin(6000t + 0.06x + 20a_y)$ where a_y denotes unit vector along y direction. The wave is propagating with a phase velocity of :

(1) 1×10^5 m/s (2) 1×10^6 m/s (3) -1×10^5 m/s (4) -1×10^6 m/s

58. If the length of the short-circuited transmission line is given as : $3/4.\lambda < l < \lambda/2$, then the input impedance is :

(1) Inductive

(2) Capacitive

(3) Zero

(4) Contains both real and imaginary parts

59. A quarter wave transformer matching a 50 Ohm source with a 200 Ohm load should have a characteristic impedance of :

(1) 50 Ohm (2) 100 Ohm (3) 150 Ohm (4) 200 Ohm

60. Match **A** (theorem) with **B** (description) :

	A		**B**
P.	curl $\vec{F} = 0$	1.	Gauss theorem
Q.	div $\vec{F} = 0$	2.	Irrotational
R.	$\iiint_V (\nabla . F) dV = \oiint_S F . dS$	3.	Solenoidal
S.	$\oiint_S F . dS = Q$	4.	Divergence theorem

(1) P - 2, Q - 3, R - 4, S - 1 (2) P - 3, Q - 2, R - 4, S - 1

(3) P - 2, Q - 3, R - 1, S - 4 (4) P - 2, Q - 4, R - 3, S - 1

61. Consider an Ideal voltage amplifier with a gain of 0.95 and a resistance R = 100 KΩ connected between output and input terminals. Use Miller's theorem to find the input resistance of this circuit :

(1) 1 MΩ (2) 2 MΩ (3) 3 MΩ (4) 4 MΩ

62. Consider an amplifier with a voltage gain of −10 and a capacitance C = 10 pF connected between output and input terminals. Use Miller's theorem to find the equivalent capacitances at the output side.

(1) 11 pF (2) 110 pF (3) 10 pF (4) 100 pF

63. The cascode amplifier is composed of direct coupled :

(1) CE-CB configuration (2) CC-CC configuration

(3) CB-CE configuration (4) None

64. CMRR is more in :

(1) Single ended amplifier (2) Differential amplifier

(3) Inverting operational amplifier (4) None

65. Common mode rejection ratio is defined as ratio of :

(1) Common mode gain to differential mode gain

(2) Differential mode gain to common mode gain

(3) Common mode gain at input to differential mode gain at input

(4) Common mode gain at output to differential mode gain at output

66. Which of following configuration called as source follower ?

(1) Common Gate (2) Common Source

(3) Common Drain (4) None

67. Dynamic power of a CMOS VLSI circuit is linearly proportional to :

(1) short-circuit current (2) switching frequency

(3) time (4) none of the above

68. Using 'Full-scaling' approach, the power dissipation of a transistor is scaled by a factor of :

(1) s (2) s^2 (3) s^3 (4) s^4

69. Dynamic power optimization technique primarily follows :

(1) Transistor sizing (2) Transistor stacking

(3) Multiple thresholds (4) None of the above

70. Which one of the following models is ***not*** related to low power design methodology ?

(1) Power consumption model (2) Current waveform model

(3) Voltage-sensitive timing model (4) None of the above

71. The far field of an antenna varies with distance r as :

(1) $1/r$ (2) $1/r^2$ (3) $1/r^3$ (4) $1/\sqrt{r}$

72. For the operation 21 + 13 = 40 to be correct what will be the base of the number :

(1) 2 (2) 4 (3) 11 (4) 8

73. The number of distinct Boolean expressions of 3 variables is :

(1) 16 (2) 256 (3) 8 (4) 1024

74. Hexadecimal number '*A*' is equal to octal number :

(1) 16 (2) 12 (3) 8 (4) 10

75. The number of bits in ASCII is :

(1) 10 (2) 12 (3) 7 (4) 4

76. The Hamming distance between 010 and 001 is :

(1) 0 (2) 1 (3) 2 (4) 3

77. ..... Satellite orbits in a circular pattern with an angular velocity equal to that of the earth.

(1) Geostationary (2) Early Bird I

(3) Stationary satellite (4) None of the above

78. The process of transferring a mobile station from one base station to another is :

(1) MSC (2) Roaming

(3) Hand off (4) Forwarding

79. For maximum radio coverage shape of the cellular region should be :

(1) Circular (2) Hexagon

(3) Square (4) Oval

80. Electrical permittivity of materials is approximately equal to square of :

(1) Refractive index

(2) Magnetic permeability

(3) Speed of light × Magnetic permeability

(4) None

81. For a silicon p + n junction diode the doping concentrations are $N_a = 10^{15}\,cm^{-3}$ and $N_d = 10^{10}\,cm^{-3}$. The minority carrier hole diffusion coefficient is $D_p = 10\ cm^2/s$ and the minority carrier hole life time is $\tau_{p0} = 10^{-5}$ s. The cross sectional area is $A = 10^{-4}\,cm^2$. The reverse saturation current is ($n_i = 1.5 \times 10^{-10}/cm^3$) :

(1) 36×10^{-12} A (2) 3.6×10^{-12} A

(3) 36×10^{-10} A (4) 3.6×10^{-10} A

82. Match A (equations) with B (relations) :

	A		B
P.	Continuity Equation	1.	Relates diffusion constant with mobility
Q.	Einstein's Equation	2.	Relates charge density with electric field
R.	Poisson's Equation	3.	Concentration gradient
S.	Diffusion Current	4.	Rate of charge of minority carrier density with time

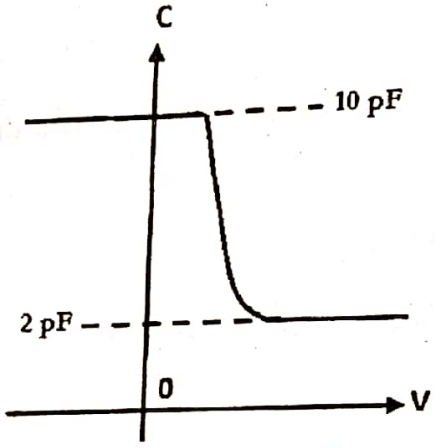
(1) P - 4, Q - 1, R - 3, S - 2 (2) P - 4, Q - 1, R - 2, S - 3

(3) P - 1, Q - 4, R - 2, S - 3 (4) P - 1, Q - 4, R - 3, S - 2

83. A Ge diode has a saturation current of 10 μA at room temperature. Then, the reverse current at T = 350° K is :

(1) 32 mA (2) 8.42 mA (3) 0.32 mA (4) 3.2 μA

84. The figure shows the high-frequency capacitance-voltage characteristics of a MOS capacitor. Assume that the permittivities of silicon and SiO_2 are 1×10^{-12} F/cm and 3.5×10^{-13} F/cm respectively. Calculate the capacitance in depletion mode.

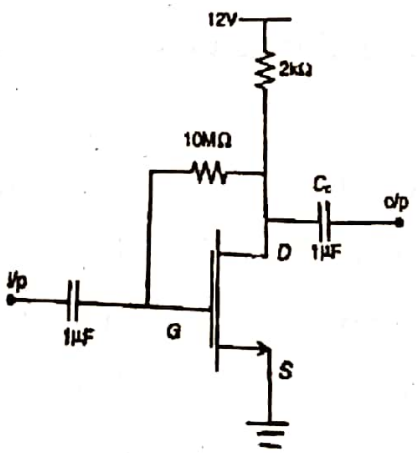


(1) 12 pF (2) 5 pF (3) 1.5 pF (4) 2.5 pF

85. If P is passivation, Q is n-well implant, R is metallization and S is source/drain diffusion, then the order in which they are carried out in a standard n-well CMOS fabrication process is :

(1) S – R – Q – P (2) R – P – S – Q (3) Q – S – R – P (4) P – Q – R – S

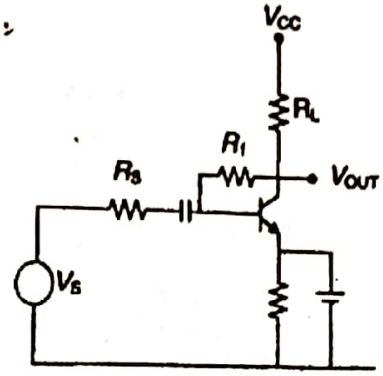
86. In the circuit given below, the parameters are $K = 0.2 \times 10^{-3} A/V^2$, $V_T = 3v$, $Y_d = 20$ μS, $V_{GSQ} = 6.4\ V$, $I_{DQ} = 2.75$ mA. The output impedance z_0 and gain A_V is :



(1) 19.23 kΩ, –3.14 (2) 1.923 kΩ, 3.14

(3) 1.923 kΩ, –3.14 (4) 12.93 kΩ, –31.4

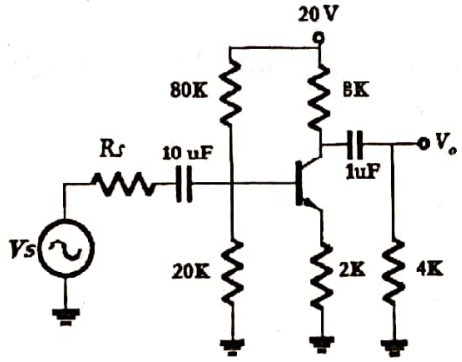
87. The type of feedback in the given circuit is :



(1) Voltage shunt (2) Current shunt

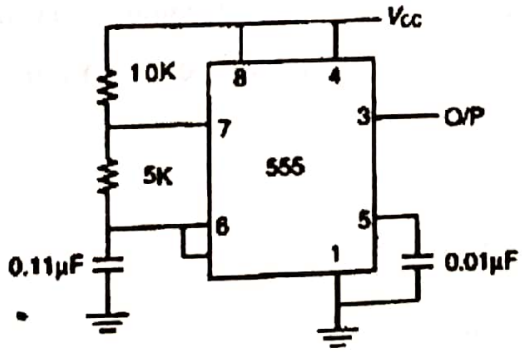
(3) Voltage series (4) Current series

88. The gain A_V of the circuit shown below is :



(1) −169 (2) −183 (3) −160 (4) −16.9

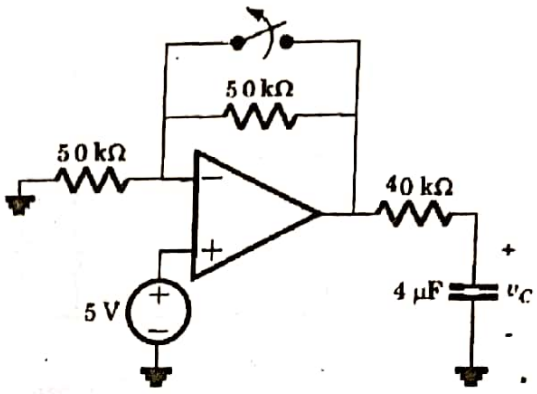
89. The 555 timer circuit as shown in figure generates a rectangular waveform. The frequency and duty cycle of the waveform are :



(1) 660 Hz, 0.45 (2) 660 Hz, 0.25

(3) 66 Hz, 0.25 (4) 6.6 Hz, 0.25

90. The circuit shown below is at steady state before the switch opens at $t = 0$. The $v_c(t)$ for $t > 0$ is :



(1) $10 - 5e^{-6.25t}$ V

(2) $5 + 5e^{-6.25t}$ V

(3) $5 + 5e^{-t/6.25}$ V

(4) $10 - 5e^{-t/6.25}$ V

91. Which one of the following is ***not*** the advantage of ion-implantation over diffusion doping ?

(1) It is a low temperature process.

(2) Point imperfections are not produced.

(3) Shallow doping is possible.

(4) Gettering is possible.

92. Imperfection arising due to the displacement of an ion from a regular site to an interstitial site maintaining overall electrical neutrality of the ionic crystal is called :

(1) Frenkel imperfection

(2) Schottky imperfection

(3) Point imperfection

(4) Volume imperfection

93. Four probe method is used to measure :

(1) resistivity of semi-conducting material

(2) mobility of carriers

(3) carrier concentration

(4) none of the above

94. In photolithography, higher the radiation wavelength :

(1) smaller is the minimum feature size

(2) larger is the minimum feature size

(3) feature size is independent of it

(4) none of these

95. Hall effect can be used to measure :

(1) mobility of carriers (2) type of semiconductor

(3) carrier concentration (4) all of these

96. Etching is always anisotropic if the material is :

(1) Crystalline (2) Polycrystalline

(3) Amorphous (4) None of the above

97. The steady state conditions in diffusion are governed by :

(1) Fick's second law (2) Fick's first law

(3) Both (1) and (2) (4) Maxwell-Boltzmann's law

98. A heavily doped buried layer is used in bipolar IC technology to :

(1) bury the defects in Silicon below the active epitaxial layer

(2) reduce the resistance to current flow from the active layer to the substrate

(3) Prevent latchup

(4) reduce the collector resistance of the bipolar transistor

99. While diffusing an impurity into silicon, if the concentration of the impurity atoms is maintained constant at the surface of the wafer, then the diffused impurity profile is a :

(1) Gaussian

(2) Exponential

(3) Quadratic

(4) Complementary error function

100. If aluminum is deposited Upon a lightly doped n-region :

(1) A schottky diode is obtained

(2) An ohmic contact is obtained

(3) A constant capacitance is obtained

(4) A high valued constant resistance can be obtained

Total No. of Printed Pages : 21

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SET-Z

D

M.Phil./Ph.D./URS-EE-2020

SUBJECT : Electronics & Communication Engg.

Sr. No. 10004

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name_____

Mother's Name_____ Date of Examination_____

(Signature of the Candidate) (Signature of the Invigilator)

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3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. For a silicon p + n junction diode the doping concentrations are $N_a = 10^{15}\,cm^{-3}$ and $N_d = 10^{10}\,cm^{-3}$. The minority carrier hole diffusion coefficient is $D_p = 10\ cm^2/s$ and the minority carrier hole life time is $\tau_{p0} = 10^{-5}$ s. The cross sectional area is $A = 10^{-4}\,cm^2$. The reverse saturation current is ($n_i = 1.5 \times 10^{-10}/cm^3$) :

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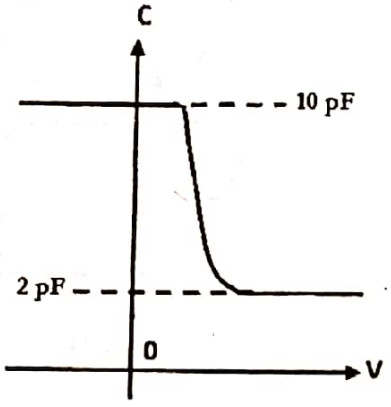

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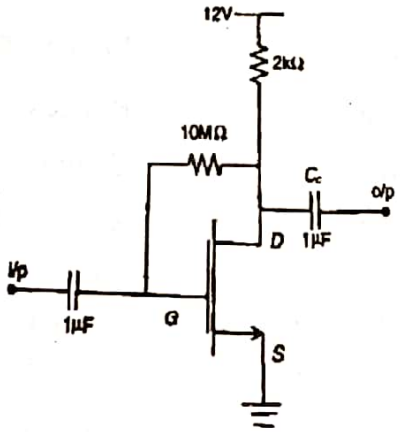

(1) 19.23 kΩ, –3.14

(2) 1.923 kΩ, 3.14

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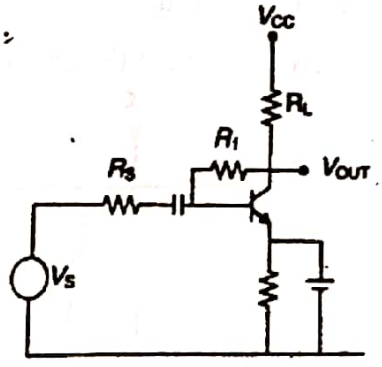
7. The type of feedback in the given circuit is :



(1) Voltage shunt

(2) Current shunt

(3) Voltage series

(4) Current series

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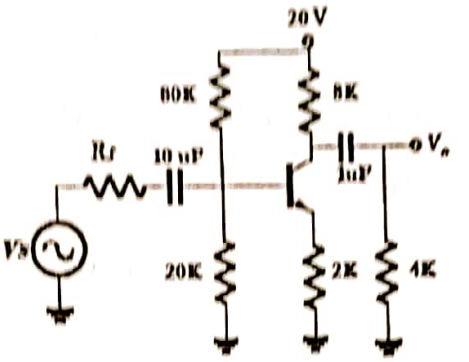

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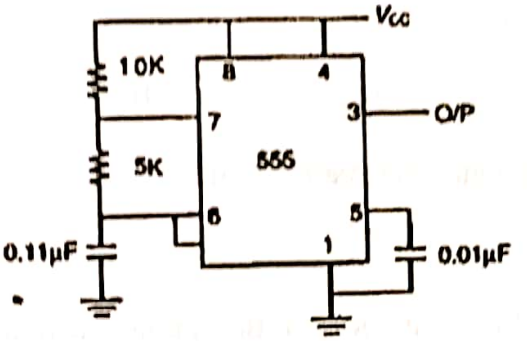

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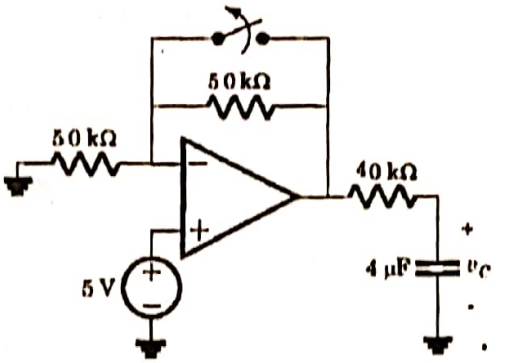
(3) 66 Hz, 0.25 (4) 6.6 Hz, 0.25

10. The circuit shown below is at steady state before the switch opens at $t = 0$. The $v_c(t)$ for $t > 0$ is :



(1) $10 - 5e^{-6.25t}$ V (2) $5 + 5e^{-6.25t}$ V

(3) $5 + 5e^{-t/6.25}$ V (4) $10 - 5e^{-t/6.25}$ V

11. The far field of an antenna varies with distance r as :

(1) $1/r$ (2) $1/r^2$ (3) $1/r^3$ (4) $1/\sqrt{r}$

12. For the operation 21 + 13 = 40 to be correct what will be the base of the number :

(1) 2 (2) 4 (3) 11 (4) 8

13. The number of distinct Boolean expressions of 3 variables is :

(1) 16 (2) 256 (3) 8 (4) 1024

14. Hexadecimal number '*A*' is equal to octal number :

(1) 16 (2) 12 (3) 8 (4) 10

15. The number of bits in ASCII is :

(1) 10 (2) 12 (3) 7 (4) 4

16. The Hamming distance between 010 and 001 is :

(1) 0 (2) 1 (3) 2 (4) 3

17. ..... Satellite orbits in a circular pattern with an angular velocity equal to that of the earth.

(1) Geostationary (2) Early Bird I

(3) Stationary satellite (4) None of the above

18. The process of transferring a mobile station from one base station to another is :

(1) MSC (2) Roaming

(3) Hand off (4) Forwarding

19. For maximum radio coverage shape of the cellular region should be :

(1) Circular (2) Hexagon

(3) Square (4) Oval

20. Electrical permittivity of materials is approximately equal to square of :

(1) Refractive index

(2) Magnetic permeability

(3) Speed of light × Magnetic permeability

(4) None

21. Consider an Ideal voltage amplifier with a gain of 0.95 and a resistance R = 100 KΩ connected between output and input terminals. Use Miller's theorem to find the input resistance of this circuit :

(1) 1 MΩ (2) 2 MΩ (3) 3 MΩ (4) 4 MΩ

22. Consider an amplifier with a voltage gain of −10 and a capacitance C = 10 pF connected between output and input terminals. Use Miller's theorem to find the equivalent capacitances at the output side.

(1) 11 pF (2) 110 pF (3) 10 pF (4) 100 pF

23. The cascode amplifier is composed of direct coupled :

(1) CE-CB configuration (2) CC-CC configuration

(3) CB-CE configuration (4) None

24. CMRR is more in :

(1) Single ended amplifier (2) Differential amplifier

(3) Inverting operational amplifier (4) None

25. Common mode rejection ratio is defined as ratio of :

(1) Common mode gain to differential mode gain

(2) Differential mode gain to common mode gain

(3) Common mode gain at input to differential mode gain at input

(4) Common mode gain at output to differential mode gain at output

26. Which of following configuration called as source follower ?

(1) Common Gate (2) Common Source

(3) Common Drain (4) None

27. Dynamic power of a CMOS VLSI circuit is linearly proportional to :

(1) short-circuit current (2) switching frequency

(3) time (4) none of the above

28. Using 'Full-scaling' approach, the power dissipation of a transistor is scaled by a factor of :

(1) s (2) s^2 (3) s^3 (4) s^4

29. Dynamic power optimization technique primarily follows :

(1) Transistor sizing (2) Transistor stacking

(3) Multiple thresholds (4) None of the above

30. Which one of the following models is ***not*** related to low power design methodology ?

(1) Power consumption model (2) Current waveform model

(3) Voltage-sensitive timing model (4) None of the above

31. Which one of the following is ***not*** the advantage of ion-implantation over diffusion doping ?

(1) It is a low temperature process.

(2) Point imperfections are not produced.

(3) Shallow doping is possible.

(4) Gettering is possible.

32. Imperfection arising due to the displacement of an ion from a regular site to an interstitial site maintaining overall electrical neutrality of the ionic crystal is called :

(1) Frenkel imperfection

(2) Schottky imperfection

(3) Point imperfection

(4) Volume imperfection

33. Four probe method is used to measure :

(1) resistivity of semi-conducting material

(2) mobility of carriers

(3) carrier concentration

(4) none of the above

34. In photolithography, higher the radiation wavelength :

(1) smaller is the minimum feature size

(2) larger is the minimum feature size

(3) feature size is independent of it

(4) none of these

35. Hall effect can be used to measure :

(1) mobility of carriers (2) type of semiconductor

(3) carrier concentration (4) all of these

36. Etching is always anisotropic if the material is :

(1) Crystalline (2) Polycrystalline

(3) Amorphous (4) None of the above

37. The steady state conditions in diffusion are governed by :

(1) Fick's second law (2) Fick's first law

(3) Both (1) and (2) (4) Maxwell-Boltzmann's law

38. A heavily doped buried layer is used in bipolar IC technology to :

(1) bury the defects in Silicon below the active epitaxial layer

(2) reduce the resistance to current flow from the active layer to the substrate

(3) Prevent latchup

(4) reduce the collector resistance of the bipolar transistor

39. While diffusing an impurity into silicon, if the concentration of the impurity atoms is maintained constant at the surface of the wafer, then the diffused impurity profile is a :

(1) Gaussian (2) Exponential

(3) Quadratic (4) Complementary error function

40. If aluminum is deposited Upon a lightly doped n-region :

(1) A schottky diode is obtained

(2) An ohmic contact is obtained

(3) A constant capacitance is obtained

(4) A high valued constant resistance can be obtained

41. An AWGN is transmitting symbols at an SNR = 30 dB. The channel capacity per symbol in the channel is :

(1) 2 bits (2) 4 bits (3) 5 bits (4) 8 bits

42. AM signal is detected using an envelope detector. With carrier frequency set at 200 Mhz and modulating signal frequency being 20 kHz, the approximate value of time constant of envelope detector is :

(1) 5 ns (2) 60 μs (3) 70 μs (4) 2.5 ns

43. A sinusoidal signal with peak to peak voltage at 2 V is quantized into 128 levels using a midrise uniform quantizer. The quantization noise power is :

(1) 2 μW (2) 10 μW (3) 40 μW (4) 20 μW

44. In a FM system, a 10 MHz carrier is modulated by a sinusoidal signal of frequency 2 kHz. Using Carson's approximation bandwidth required is 0.1 MHz. If $y(t)$ = (modulated signal)^3. Then by using Carson's approximation, the bandwidth of $y(t)$ around 30 MHz is :

(1) 0.1 MHz (2) 0.2 MHz (3) 0.3 MHz (4) 0.5 MHz

45. The input to the matched filter is given by

$s(t) = 20\sin(2\pi \times 10^5 t)$ for $0 < t < 10^{-3}$ s

$= 0$ elsewhere

The peak amplitude of filter output is :

(1) 20 V (2) 2 V (3) 10 V (4) 0.2 V

46. Which of the following does ***not*** satisfy the wave equation ?

(1) $Ae^{j(wt-2z)}$ (2) $\cos(w(z + t))$

(3) $\cos x . \cos t$ (4) $\cos(y^3 + 5t)$

47. The electric field intensity vector of a plane wave is given by $E(r, t) = 10 \sin(6000t + 0.06x + 20a_y)$ where a_y denotes unit vector along y direction. The wave is propagating with a phase velocity of :

(1) 1×10^5 m/s (2) 1×10^6 m/s (3) -1×10^5 m/s (4) -1×10^6 m/s

48. If the length of the short-circuited transmission line is given as : $3/4.\lambda < l < \lambda/2$, then the input impedance is :

(1) Inductive

(2) Capacitive

(3) Zero

(4) Contains both real and imaginary parts

49. A quarter wave transformer matching a 50 Ohm source with a 200 Ohm load should have a characteristic impedance of :

(1) 50 Ohm (2) 100 Ohm (3) 150 Ohm (4) 200 Ohm

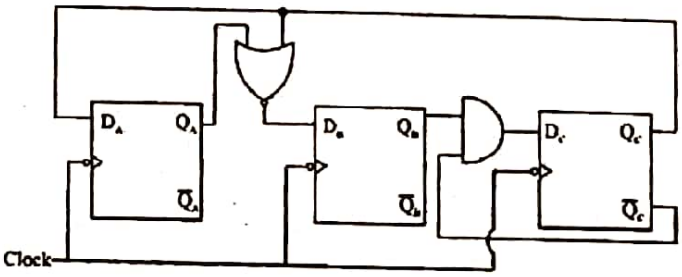
50. Match **A** (theorem) with **B** (description) :

	A		**B**
P.	curl $\vec{F} = 0$	1.	Gauss theorem
Q.	div $\vec{F} = 0$	2.	Irrotational
R.	$\iiint_V (\nabla . F) dV = \oiint_S F . dS$	3.	Solenoidal
S.	$\oiint_S F . dS = Q$	4.	Divergence theorem

(1) P - 2, Q - 3, R - 4, S - 1 (2) P - 3, Q - 2, R - 4, S - 1

(3) P - 2, Q - 3, R - 1, S - 4 (4) P - 2, Q - 4, R - 3, S - 1

51. If all flip-flops are reset to '0' at power on, then the total number of output states (*ABC*) represented by this counter is equal to :



(1) 3 (2) 5 (3) 4 (4) 7

52. Given $F = F_1 . F_2$, where $F(A, B, C, D) = \Sigma m\ (4, 7, 15)$, $F_1(A, B, C, D) = \Sigma m\ (0, 1, 2, 3, 4, 7, 8, 9, 10, 11, 15)$, the possible function for F_2 is :

(1) $\Sigma m\ (5, 6, 12, 13, 14)$ (2) $\Sigma m\ (4, 5, 6, 7, 8, 12, 13, 14, 15)$

(3) $\Sigma m\ (5, 6, 12, 13, 4, 7, 15)$ (4) None of these

53. 1000 H : LXI SP, 0FFFH

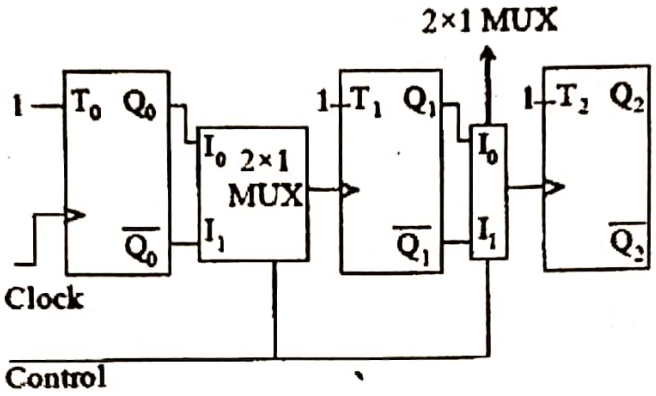
CALL 2050H

After call, content of PC and SP is :

(1) PC = 1006 H, SP = 0FFFH (2) PC = 2050 H, SP = 0FFFH

(3) PC = 2050 H, SP = 0FFDH (4) PC = 1006 H, SP = 0FFDH

54. For the given sequential circuit, which of the following statements are true :



a. For control = 0 it will acts as down counter

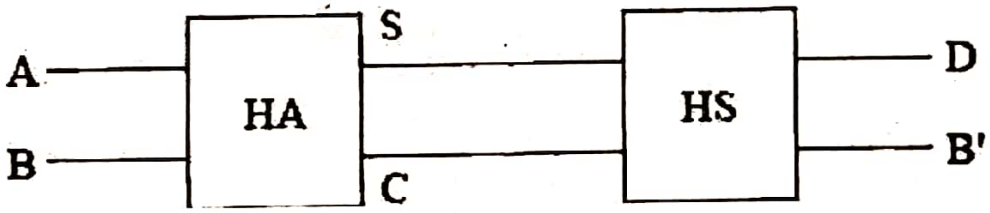
b. For control = 1 it will acts at up counter

c. Synchronous counter

d. Asynchronous counter

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

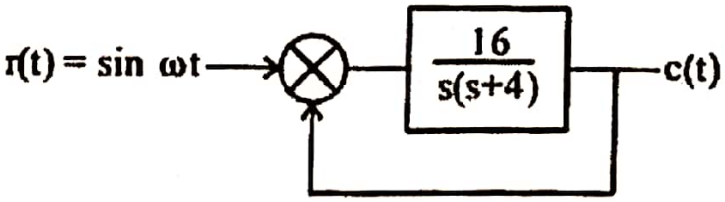
55. The half adders and half substractor are connected as shown in figure below. The output D and B' are :



(1) $D = A \oplus B;\ B' = AB$ (2) $D = A + B;\ B' = 0$

(3) $D = AB;\ B' = 0$ (4) $D = A + B;\ B' = AB$

56. In the system shown below, the steady state response c(t) will exhibit a resonant peak at a frequency of ..... rad/sec. (rounding up to 2 decimals)



(1) $2\sqrt{2}$ (2) $4\sqrt{2}$ (3) $6\sqrt{2}$ (4) $8\sqrt{2}$

57. TF of a unity feedback system is $\frac{1}{(4s^2+s+4)}$. The magnitude of the system at 0.1591 Hz is approximately ..... dB.

(1) 0 (2) 1 (3) 2 (4) 3

58. By performing cascading / summing / differencing operations using transfer function blocks $G_1(s)$ and $G_2(S)$ one cannot realize a transfer function of the form :

(1) $G_1(S)\ G_2(S)$ (2) $\frac{G_1(S)}{G_2(S)}$

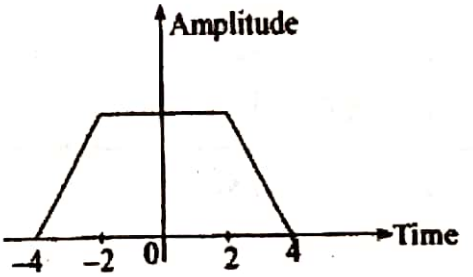
(3) $G_2(S)\left(\frac{1}{G_1(S)}+G_2(S)\right)$ (4) $G_1(S)\left(\frac{1}{G_1(S)}-G_2(S)\right)$

59. The impulse response of a discrete LTI system is given by $h(n) = -(0.25)^{-n}\,u\,(n-4)$. The system is :

(1) Causal and stable (2) Causal and unstable

(3) Non causal and stable (4) Non-causal and unstable

60. The graph shown below represents a wave form obtained by convolving two rectangular waveform of duration :



(1) 4 units each (2) 4 and 2 units respectively

(3) 6 and 3 units respectively (4) 6 and 2 units respectively

61. The Fermi level of a metal is the :

(1) Energy at which the probability of finding an electron is 1/2.

(2) The highest energy an electron can possess inside the metal.

(3) The energy required to take an electron from metal to vacuum.

(4) The lowest energy an electron possess at 0K.

62. In a semiconductor, the probability of finding an electron at an energy ΔE above the bottom of the conduction band is always ..... the probability of finding a hole at an energy ΔE below the top of the valence band.

(1) greater than (2) equal to

(3) less than (4) unequal to

63. In the piecewise linear diode model, the diode resistance is :

(1) low for all biases

(2) high for all biases

(3) low for biases greater than cut-in voltage and high for biases less than cut-in voltage

(4) high for biases greater than cut-in voltage and low for biases less than cut-in voltage

64. In the triode region, the $I_D - V_{DS}$ characteristics of a MOSFET are :

(1) hyperbolic (2) linear (3) quadratic (4) exponential

65. In the common emitter configuration, if the transistor is in the saturation region, then :

(1) $I_C > I_E$ (2) $I_C < \beta I_B$ (3) $I_E < I_B$ (4) $I_B > \beta I_C$

66. The LEVEL 1 SPICE model implements :

(1) Square Law model (2) Alpha Power Law model

(3) Injection Velocity model (4) Velocity Saturation model

67. BSIM 1 is a :

(1) Charge based model

(2) Threshold voltage based model

(3) Surface potential based model

(4) None of the above

68. PSP is a :

(1) Charge based model
(2) Threshold voltage based model
(3) Surface potential based model
(4) None of the above

69. EKV is a :

(1) Charge based model
(2) Threshold voltage based model
(3) Surface potential based model
(4) None of the above

70. BSIM4 model considers the influence of narrow width effect (NWE) on :

(1) Mobility only
(2) Threshold voltage only
(3) Saturation velocity only
(4) All of the above

71. The threshold voltage of an n-channel MOSFET can be increased by :

(1) Increasing the channel dopant concentration
(2) Reducing the channel dopant concentration
(3) Reducing the gate oxide thickness
(4) Reducing the channel length

72. In modern technology, the gate material used for a MOSFET is :

(1) Heavily doped polycrystalline silicon
(2) Pure silicon
(3) High purity silica oxide
(4) Epitaxial grown silicon

73. A certain gate draws 1.8μA when its output is HIGH and 3.3μA when its output is LOW. V_{CC} is 5V and the gate is operated on a 50% duty cycle. The average power dissipation (P_D) is :

(1) 2.55 μW (2) 1.27 μW (3) 12.75 μW (4) 5 μW

74. In BiCMOS circuits :

(1) CMOS is used for implementing logic and BJT is used for high drive current

(2) BJT is used for implementing logic and CMOS is used for high drive current

(3) CMOS is used for implementing logic and BJT is used for low power

(4) CMOS is used for high speed and BJT is used for high drive current

75. Propagation delay of a cell primarily depends on :

(1) Output transition and input load

(2) Input transition and output load

(3) Input transition and output transition

(4) Input load and output load

76. If metal 6 and metal 7 are used for the power in 7 metal layer process design then which metals you will use for clock ?

(1) Metal 1 and metal 2 (2) Metal 3 and metal 4

(3) Metal 4 and metal 5 (4) Metal 6 and metal 7

77. Emitter-coupled logic (ECL) is the fastest bipolar transistor logic because :

(1) it uses current, rather than voltages, as the output variables

(2) it uses a circuit configuration that prevents the transistors from going into saturation

(3) it has no p-n-p transistors

(4) it uses differential inputs

78. A Schmitt trigger circuit achieves hysteresis by utilizing :

(1) the magnetic properties of a transformer code

(2) avalanche multiplication in a zener (tunnel) diode

(3) the Barkhausen principle

(4) regenerative positive feedback

79. When a step input is applied to an inverter made with an n-p-n transistor, such that the transistor goes from cutoff to saturation, there is a delay time (t_d) before the output goes low. The delay time is due partly to :

(1) the stored minority carrier charge in the base

(2) the charging of the base-collector junction capacitance

(3) the charging of the base-emitter junction capacitance

(4) the discharging of the minority carrier stored charge in the collector

80. Which equation related to noise margins is ***correct*** ?

(1) $V_{NL} = V_{IL(\max)} + V_{OL(\max)}$ (2) $V_{NH} = V_{OH(\min)} + V_{IH(\min)}$

(3) $V_{NL} = V_{OH(\min)} - V_{IH(\min)}$ (4) $V_{NH} = V_{OH(\min)} - V_{IH(\min)}$

81. Given that :

$$A = \begin{bmatrix} -5 & -3 \\ 2 & 0 \end{bmatrix} \text{ and } I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

The, the value of A^3 is :

(1) $15A + 12I$ (2) $19A + 30I$

(3) $17A + 15I$ (4) $17A + 21I$

82. A fair coin is tossed 10 times. What is the probability that only the first two tosses will yield heads ?

(1) $\left(\frac{1}{2}\right)^2$ (2) ${}^{10}C_2\left(\frac{1}{2}\right)^2$

(3) $\left(\frac{1}{2}\right)^{10}$ (4) ${}^{10}C_2\left(\frac{1}{2}\right)^{10}$

83. $I = \int_0^1 x^5 \sqrt{(1-x^2)^5}\ .dx =$

(1) $\frac{8}{693}$ (2) $\frac{5}{317}$ (3) $\frac{8}{315}$ (4) $\frac{41}{720}$

84. Match the following and choose the correct combination :

Group-1		Group-2	
A.	Newton-Raphson method	1.	Solving non-linear equations
B.	Runge-Kutta method	2.	Solving linear simultaneous equations
C.	Simpson's rule	3.	Solving ordinary differential equations
D.	Gauss elimination	4.	Numerical integration
		5.	Interpolation
		6.	Calculation of eigen values

(1) A - 6, B - 1, C - 5, D - 3 (2) A - 1, B - 6, C - 4, D - 3

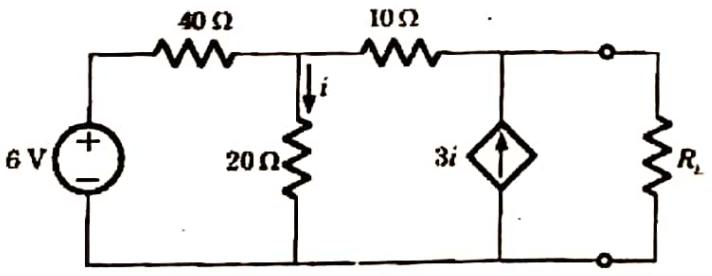
(3) A - 1, B - 3, C - 4, D - 2 (4) A - 5, B - 3, C - 4, D - 1

85. The length of arc of the curve $x = t^2$, $y = t^2$ from $t = 0$ to $t = 4$ is :

(1) $\frac{8}{27}\left(37\sqrt{37} - 1\right)$ (2) $\frac{3}{5}\left(\sqrt{2} - 1\right)$

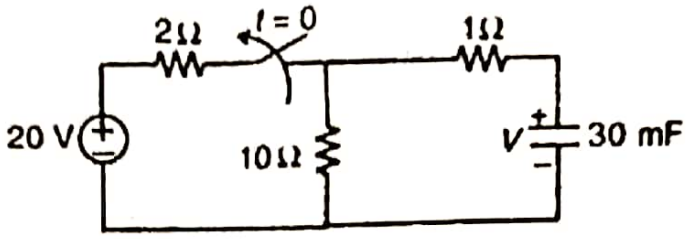
(3) $\frac{5}{21}$ (4) $\frac{5-\sqrt{3}}{2}$

86. In the circuit given below, the R_L will absorb maximum power if R_L is equal to :



(1) 40/3 Ohm (2) 60/3 Ohm (3) 70/3 Ohm (4) 20/3 Ohm

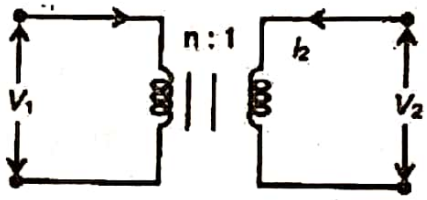
87. In the circuit given below the switch is opened at $t = 0$ after long time. The voltage $v(t)$ for $t \geq 0$ is :



(1) $50/3\, e^{(-t/0.33)}$ V (2) $15/3\, e^{(-t/0.33)}$ V

(3) $50/3\, e^{(-t/30)}$ V (4) $50/3\, e^{(-0.33t)}$ V

88. From the *ABCD* parameters of an ideal n : 1 transformer shown in figure below, the value of *D* is :



(1) n (2) $1/n$ (3) n^2 (4) $1/n^2$

89. Fourier transform of the signal $u(t)$ is given by :

(1) 1 (2) $\pi\delta(\omega) - 1/j\omega$

(3) $2\pi\delta(\omega)$ (4) $\pi\delta(\omega) - j/\omega$

90. A series resonant circuit has L = 20 mH and C = 10 mF. The required R for the bandwidth of 50 Hz is :

(1) 16 Ohm (2) 1 Ohm (3) 0.1 Ohm (4) 10 Ohm

91. In 'clock gating' methodology, power can be reduced by :

(1) Reducing the effective frequency

(2) Reducing wasted operations

(3) Minimizing the power of each access

(4) None of the above

92. Using 'Alpha-power law model', the value of 'α' for 65–180 nm CMOS technology lies in the range of :

(1) 0.6 ~ 0.7 (2) 1.0 ~ 1.1 (3) 1.2 ~ 1.3 (4) 1.5 ~ 2.0

93. Using 'Monte Carlo Technique', one can choose N randomly distributed points x_1, x_2, x_3, ..., x_N in a multidimensional volume V to determine the integral of a function f. Then, the function f results in :

(1) $\int f dV \approx V < f > + \sqrt{\frac{< f^2 > - < f >}{N}}$

(2) $\int f dV \approx V < f > - \sqrt{\frac{< f^2 > - < f >}{N}}$

(3) $\int f dV \approx V < f > \pm \sqrt{\frac{< f^2 > - < f >}{N}}$

(4) $\int f dV \approx V < f > \mp \sqrt{\frac{< f^2 > - < f >}{N}}$

where $< f > \equiv \frac{1}{N} \sum_{i=1}^{N} f(x_i)$ and $< f^2 > \equiv \frac{1}{N} \sum_{i=1}^{N} f^2(x_i)$

94. Latches constructed with NOR and NAND gates tend to remain in the latched condition due to which configuration feature ?

(1) asynchronous operation (2) low input voltages

(3) gate impedance (4) cross coupling

95. Four J-K flip-flops are cascaded with their J-K inputs tied HIGH. If the input frequency (f_{in}) to the first flip-flop is 32 kHz, the output frequency (f_{out}) will be :

(1) 1 kHz (2) 2 kHz (3) 4 kHz (4) 16 kHz

96. Which type of analysis cannot be supported by SPICE ?

(1) non-linear d.c. (2) non-linear a.c.

(3) linear a.c. (4) temperature

97. How can you best use schematics to create a netlist which is easy to understand ?

(1) Allocate node numbers randomly.

(2) Use existing part numbers.

(3) Work through the circuit diagram adding the parts to the netlist as you encounter them.

(4) By annotating the schematic with our own practical node numbers that can then be used for the netlist.

98. In a synchronous circuit, positive clock skew occurs only when :

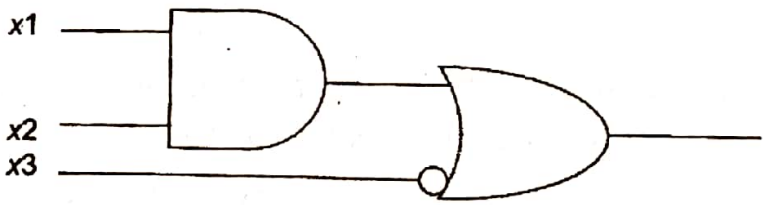
(1) the transmitting register receives the clock earlier than the receiving register

(2) the transmitting register receives the clock after the receiving register

(3) the receiving register gets the clock earlier than the sending register

(4) the receiving register gets the clock after the sending register

99. Calculate the signal probability for the following logic circuits with inputs x_1, x_2 and x_3 :



(1) 0.35 (2) 0.5 (3) 0.625 (4) 0.78

100. Double Gate MOSFETs are preferred over Single Gate MOSFETs due to :

(1) Easy fabrication

(2) Better control over channel

(3) Reduced Channel length

(4) Smaller size of Source/Drain

Ph.D/URS –EE20 Electronics & Communication Engineering

Answer Key Set A

Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer
1	B	21	C	41	A	61	B	81	A
2	C	22	A	42	D	62	A	82	C
3	A	23	C	43	C	63	C	83	C
4	C	24	C	44	C	64	A	84	D
5	A	25	D	45	B	64	B	85	B
6	C	26	A	46	A	66	C	86	B
7	A	27	A	47	B	67	B	87	D
8	B	28	B	48	C	68	D	88	A
9	D	29	B	49	A	69	C	89	C
10	B	30	D	50	B	70	D	90	B
11	D	31	C	51	C	71	B	91	A
12	B	32	A	52	A	72	A	92	A
13	C	33	D	53	A	73	C	93	B
14	D	34	C	54	B	74	B	94	B
15	C	35	D	55	D	75	B	95	C
16	C	36	D	56	A	76	C	96	C
17	A	37	A	57	B	77	B	97	A
18	A	38	A	58	D	78	B	98	C
19	B	39	B	59	D	79	A	99	B
20	A	40	A	60	A	80	D	100	A

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Answer Key Set B

Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer
1	B	21	C	41	A	61	A	81	C
2	A	22	A	42	A	62	C	82	A
3	C	23	D	43	B	63	C	83	C
4	B	24	C	44	B	64	D	84	C
5	B	25	D	45	C	64	B	85	D
6	C	26	D	46	C	66	B	86	A
7	B	27	A	47	A	67	D	87	A
8	B	28	A	48	C	68	A	88	B
9	A	29	B	49	B	69	C	89	B
10	D	30	A	50	A	70	B	90	D
11	C	31	D	51	B	71	A	91	B
12	A	32	B	52	A	72	D	92	C
13	A	33	C	53	C	73	C	93	A
14	B	34	D	54	A	74	C	94	C
15	D	35	C	55	B	75	B	95	A
16	A	36	C	56	C	76	A	96	C
17	B	37	A	57	B	77	B	97	A
18	D	38	A	58	D	78	C	98	B
19	D	39	B	59	C	79	A	99	D
20	A	40	A	60	D	80	B	100	B

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Answer Key Set C

Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer
1	A	21	B	41	B	61	B	81	D
2	D	22	C	42	A	62	A	82	B
3	C	23	A	43	C	63	C	83	C
4	C	24	C	44	A	64	B	84	D
5	B	25	A	45	B	64	B	85	C
6	A	26	C	46	C	66	C	86	C
7	B	27	A	47	B	67	B	87	A
8	C	28	B	48	D	68	B	88	A
9	A	29	D	49	C	69	A	89	B
10	B	30	B	50	D	70	D	90	A
11	C	31	A	51	C	71	A	91	C
12	A	32	C	52	A	72	A	92	A
13	C	33	C	53	D	73	B	93	A
14	C	34	D	54	C	74	B	94	B
15	D	35	B	55	D	75	C	95	D
16	A	36	B	56	D	76	C	96	A
17	A	37	D	57	A	77	A	97	B
18	B	38	A	58	A	78	C	98	D
19	B	39	C	59	B	79	B	99	D
20	D	40	B	60	A	80	A	100	A

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Answer Key Set D

Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer	Q No	Answer
1	D	21	B	41	C	61	A	81	B
2	B	22	A	42	A	62	D	82	C
3	C	23	C	43	D	63	C	83	A
4	D	24	B	44	C	64	C	84	C
5	C	25	B	45	D	64	B	85	A
6	C	26	C	46	D	66	A	86	C
7	A	27	B	47	A	67	B	87	A
8	A	28	B	48	A	68	C	88	B
9	B	29	A	49	B	69	A	89	D
10	A	30	D	50	A	70	B	90	B
11	A	31	C	51	C	71	B	91	A
12	A	32	A	52	A	72	A	92	C
13	B	33	A	53	C	73	C	93	C
14	B	34	B	54	C	74	A	94	D
15	C	35	D	55	D	75	B	95	B
16	C	36	A	56	A	76	C	96	B
17	A	37	B	57	A	77	B	97	D
18	C	38	D	58	B	78	D	98	A
19	B	39	D	59	B	79	C	99	C
20	A	40	A	60	D	80	D	100	B