

062/2016

Maximum : 100 marks

Time : 1 hour and 15 minutes

1. Article 56 of Indian constitution declares :
 - (A) Election of the President
 - (B) Manner of election of the president
 - (C) Qualifications for election as president
 - (D) Term of office of president

2. Among the following which is not a sub clause of Article 19 :
 - (A) Right to establish and maintain institutions for religious and charitable purposes
 - (B) Right to form associations
 - (C) Right to assemble peaceably and without arms
 - (D) Freedom of speech and expression

3. According to Article 315, Public Service Commission is :
 - (A) A statutory body
 - (B) A governing body for recruitments
 - (C) An independent expert body
 - (D) A quasi-government body with judicial powers

4. A Proclamation of Emergency issued under clause (1) of article 352 may be varied or revoked by :
 - (A) The impeachment of the president
 - (B) A subsequent proclamation
 - (C) A vote on account in the houses of parliament
 - (D) Expiration of a period of 15 days from the date of proclamation

5. The article which states that the president shall appoint a person who is qualified to be appointed a judge of Supreme Court to be Attorney-General for India.
 - (A) Article 75
 - (B) Article 76
 - (C) Article 77
 - (D) Article 78

6. The length of Tran-Siberian rail road :
- (A) 8289 km (B) 9289 km
(C) 8689 km (D) 9689 km
7. Mahatma Gandhi Sethu is built across the river :
- (A) Ganga (B) Yamuna
(C) Sarayu (D) Brahmaputra
8. What is the height of the highest viaduct bridge in Asia which is built in Konkan rail road?
- (A) 46 meters (B) 57 meters
(C) 64 meters (D) 79 meters
9. Light absorbing organic carbon which causes decoulation of Taj is also known as :
- (A) Brown carbon (B) Black carbon
(C) Blue carbon (D) Grey carbon
10. The date on which Malayala Manorama started publication as a weekly :
- (A) January 22, 1888 (B) February 22, 1889
(C) March 22, 1890 (D) April 22, 1891
11. The place where world's first bit coin ATM was set up :
- (A) New York (B) Dublin
(C) Toronto (D) Vancouver
12. The deepest immersed intercontinental tube tunnel rail road is :
- (A) Madrid (B) Prague
(C) Texas (D) Marmaray
13. What do you mean by 'boat people problem'?
- (A) Refugee problem (B) Economic melt-down
(C) Political instability (D) Terrorism
14. What is the old name of INS Vikramaditya?
- (A) Adm. Rustov (B) Adm. Pavlov
(C) Adm. Gorshghov (D) Adm. Vagogue

15. The head office of World Tourism Organisation is situated at :
- (A) Geneva (B) New York
(C) Madrid (D) Manchester
16. The world mothertongue day is observed on :
- (A) March 21 (B) February 21
(C) April 21 (D) May 21
17. Who formed the first trade union movement – Travancore Labour Association in Kerala?
- (A) P. Krishnapillai (B) R. Sugathan
(C) T.V. Thomas (D) P.K. Bava
18. The first book written by E.M.S. Namboodirippad is :
- (A) A short history of the peasant movement in Kerala
(B) Thirinhunokkumbol
(C) Gandhiyum Gandhisavum
(D) Jawaharlal Nehru
19. The name of committee set up in 1995 to study the Prasar Bharathi Act.
- (A) Sengupta committee (B) B.G. Verghese committee
(C) Joshi committee (D) Justice Rajadhyaksha committee
20. The date on which the Akashavani-Doordarshan DTH service came into being :
- (A) 16th January 2004 (B) 16th December 2004
(C) 16th November 2004 (D) 16th October 2004
21. Let A be a 3×3 matrix with characteristic polynomial $p(\lambda) = \lambda(\lambda - 1)(\lambda - 2)$. Which of the following statement is wrong :
- (A) A is not invertible
(B) There are three eigen vectors V_1, V_2, V_3 which form as eigen basis of R^3
(C) Each eigen space of A is one-dimensional
(D) The linear system $(A - 3I)x = B$ has a unique solution for each B in R^3

22. The maximum value of $(xy)^6$ on the ellipse $\frac{x^2}{4} + y^2 = 1$ occurs at a point (x, y) for which y^2 is equal to :

(A) $\frac{\sqrt{2}}{3}$

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

(C) $\frac{2}{3}$

(D) $\frac{5}{4}$

23. Which of the following is the Laplace transform of $f(t) = \begin{cases} 1, & 0 \leq t \leq 2 \\ t^2 - 4t + 4, & t > 2 \end{cases}$

(A) $\frac{2e^{-2s}}{s^3}$

(B) $\frac{1 - e^{-2s}}{s} + \frac{2e^{-2s}}{s^3}$

(C) $\frac{e^{-2s}}{s} + \frac{2 - 2e^{-2s}}{s^3}$

(D) $\frac{2 - 2e^{-2s}}{s^3}$

24. What is the image of $|z| < 1$ under the transformation $w = \frac{i - z}{i + z}$?

(A) right half plane

(B) upper half plane

(C) right half of $|w| < 1$

(D) $|w| < 1$

25. If \vec{u} and \vec{v} are irrotational vectors which of the following is true?

(A) $\vec{u} \cdot \vec{v}$ is irrotational

(B) $\vec{u} \times \vec{v}$ is irrotational

(C) $\vec{u} \times \vec{v}$ is solenoidal

(D) $\vec{u} \times \vec{v} = \vec{0}$

26. When a body of mass moment of inertia I about a given axis is rotated about that axis with an angular velocity ω , then the kinetic energy of rotation is :

(A) $I\omega$

(B) $I\omega^2$

(C) $0.5 I\omega$

(D) $0.5 I\omega^2$

27. The resultant of two forces each equal to 2 N and acting at right angles is :

(A) $2/\sqrt{2}$

(B) $\sqrt{2}/2$

(C) $2\sqrt{2}$

(D) $\sqrt{2}$

28. A ridge formed by the intersection of two sloped surfaces having an exterior angle greater than 180° is called :
- (A) gable (B) hip
(C) verge (D) template
29. If magnetic bearing of sun at noon at a place in southern hemisphere is 150° , then magnetic declination at that place is :
- (A) 30° E (B) 30° W
(C) 20° E (D) 20° W
30. When (H) is the difference in heights between the extremities of a chain length (L), then the correction for slope required is :
- (A) H/L (B) H^2/L
(C) $H^2/2L$ (D) $H/2L$
31. An engine of 105 kW capacity requires 10 kW to start the engine. Its mechanical efficiency is :
- (A) 87.2% (B) 91.3%
(C) 85.2% (D) 93.1%
32. In the vapour compression cycle the condition of refrigerant is superheated vapour :
- (A) before passing through the condenser
(B) after passing through the condenser
(C) after passing through the expansion valve
(D) before passing through the expansion valve
33. Specific speed of a turbine depends upon :
- (A) speed and head (B) speed, discharge and head
(C) speed power and discharge (D) speed, power and head
34. Which of the following manufacturing processes be likely to produce the strongest parts?
- (A) investment casting (B) die casting
(C) forging (D) powder metallurgy

35. Climb milling is preferred while machining since :
- (A) the chip thickness increases gradually
 - (B) it enable the cutter to dig in and start the cut
 - (C) better surface finish can be obtained
 - (D) the specific power consumption is reduced
36. Two resistors of 80Ω and 120Ω are connected in parallel. If the current through 80Ω resistor is 7 A, calculate the total current flowing through the circuit :
- (A) 5.6 A
 - (B) 12.6 A
 - (C) 11.6 A
 - (D) 14.6 A
37. The unit of magneto motive force is :
- (A) Weber
 - (B) Ampere/metre
 - (C) Henry
 - (D) Ampere-turn/weber
38. Three equal impedances are first connected in star across a balanced three phase supply. If connected in delta across the same supply :
- (A) Phase current will be tripled
 - (B) Phase current will be doubled
 - (C) Line current will become one third
 - (D) Power consumed will increase three fold
39. The power factor of an alternator is determined by its :
- (A) Speed
 - (B) Load
 - (C) Excitation
 - (D) Prime mover
40. A synchronous machine is called doubly excited machine because :
- (A) It can be over excited
 - (B) It has two sets of rotor poles
 - (C) Both its rotor and stator are excited
 - (D) It needs twice the normal exciting current
41. Temperature compensation of a 18 V zener diode can be achieved by connecting it in :
- (A) Parallel with forward biased Si diodes
 - (B) Series with reverse biased Si diodes
 - (C) Series with forward biased Si diodes
 - (D) Parallel with reverse biased Si diodes

42. The transformer utilization factor of a full wave rectifier is :
- (A) 0.287 (B) 0.693
(C) 0.487 (D) 0.675
43. Identify the wrong statement regarding the Miller capacitance of a CE amplifier :
- (A) It increases the input capacitance
(B) It decreases the input capacitance
(C) It decreases the gain at high frequencies
(D) It increases the level of output capacitance
44. An AM transmitter has an rms antenna current of 11 A when unmodulated and 13 A when sinusoidally modulated. The modulation index is :
- (A) 0.79 (B) 0.98
(C) 0.33 (D) 0.89
45. In the visual display on the CRT screen, the sweep voltage causes the spot to move about the screen :
- (A) horizontally from left to right at a constant velocity
(B) vertically from top to bottom with constant velocity
(C) horizontally from left to right with linearly increasing velocity
(D) vertically from top to bottom with linearly increasing velocity
46. Central Processing Unit is a combination of :
- (A) Control and storage (B) Control and output unit
(C) Arithmetic logic and input unit (D) Arithmetic logic and control unit
47. Which of the following memories needs refreshing?
- (A) SRAM (B) DRAM
(C) ROM (D) All of above
48. Recursion is a process in which a function calls :
- (A) itself (B) another function
(C) main() function (D) none of the above

49. What will be the final values of x and y?

```
void main ()
{
    int x = 1, y = 1;
    clrscr();
    do while (x<=7)
    {
        x++, y++;
    }
    while (y<=5);
    printf("\n x = %d y = %d", x, y);
}
```

(A) x = 6 y = 6

(B) x = 8 y = 6

(C) x = 8 y = 8

(D) none of the above

50. What will be the output of the following program?

```
void main()
{
    char x = 'd';
    clrscr();
    switch (x)
    {
        case 'b'
        puts ("0 1 001");
        break;
        default :
        puts ("3 2 1");
        break;
        case 'R' :
        puts ("I II III");
    }
}
```

(A) 0 1 001

(B) 3 2 1

(C) I II III

(D) none of the above

51. A zener diode voltage regulator has load requirement of 12 V and 2 Amp. The zener diode's minimum current requirement is 0.2 A. The minimum voltage at input is 24 V. What is maximum efficiency of circuit? (upto 1 decimal place)?

- (A) 45.5% (B) 35.7%
(C) 50.5% (D) 55.7%

52. How many op-amps are required to implement this equation?

$$V_0 = \frac{R_3}{R_1 + R_3} \frac{R_2 + R_4}{R_2} V_1 - \frac{R_4}{R_2} V_2$$

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

53. An FIR system is described by the system function $H(z) = 1 + 7/2 z^{-1} + 3/2 z^{-2}$. The system is :

- (A) maximum phase (B) minimum phase
(C) mixed phase (D) zero phase

54. The forward path transfer function of a unity negative feedback system is given by :

$$G(s) = \frac{K}{(s+2)(s-1)}$$

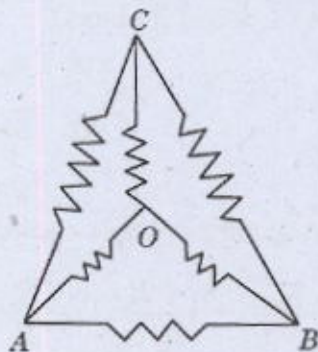
The value of K which will place both the poles of the closed-loop system at the same location, is k , then $4k$ is?

- (A) 2.25 (B) 5
(C) 4.5 (D) 9

55. A radio system outputs signals with frequency components only in the range 2.5 MHz to 3.5 MHz. The analog-to-digital converter that you want to use to digitise such signals can be operated at sampling frequencies that are an integer multiple of 1 MHz. What is the lowest sampling frequency (in MHz) that you can use without destroying information through aliasing?

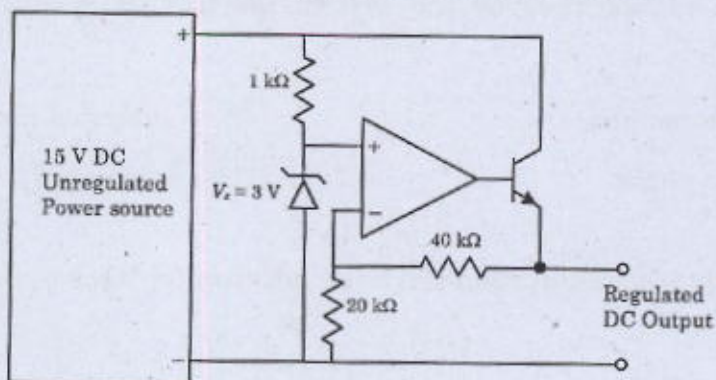
- (A) 3 (B) 7
(C) 5 (D) 2

56. Six equal resistances each of 10 ohms are connected to form a network as shown in diagram. What are the equivalent resistance between A and B in ohms?



- (A) 6 (B) 4
(C) 5 (D) 10

57. The circuit below is a regulated power supply, the output voltage is :



- (A) 15 V (B) 12 V
(C) 9 V (D) 14 V

58. The response of an initially relaxed circuit to a signal V_s is $e^{-2t} u(t)$. If the signal is changed to $(V_s + 2dV_s/dt)$, the response would be :

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

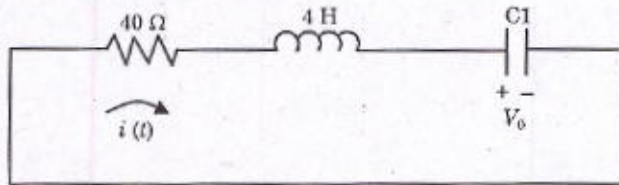
59. A wave of frequency 6 GHz is propagated in a parallel plane waveguide with plane separation of 3 cm. The group velocity is given as c/x then $10x$ is? ($c = 3 \times 10^8$)

- (A) 18 (B) 1.8
(C) 180 (D) 0.18

60. When a 1 Mhz signal is combined with the output of a 1.3 Mhz oscillator, the beat frequency obtained will be (in KHz) :

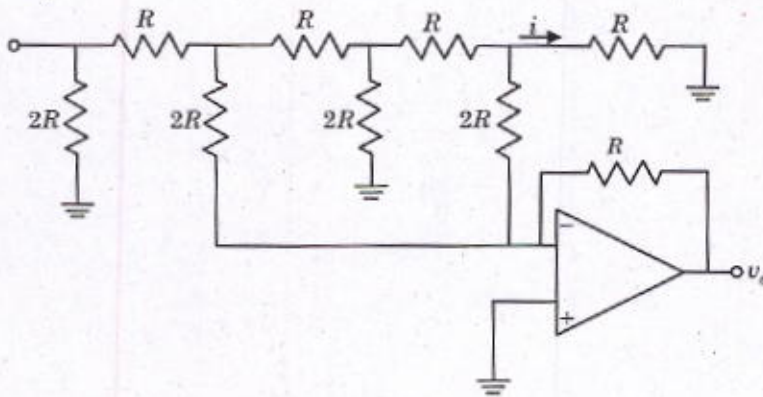
- (A) 1 (B) 3
(C) 300 (D) 1000

61. In the circuit shown in the figure, the value of capacitor C (in mF) needed to have critically damped response $i(t)$ is x , then $x/2 =$:



- (A) 10 (B) 5
(C) 8 (D) 4

62. The circuit shown below is a digital-to Analog converter with $V_R = 10$ V and $R = 10$ k Ohm.



The current I (in μA) is

- (A) 125 (B) 62.5
(C) 31.25 (D) 90

63. The closed loop transfer function of a unity feedback control system whose step response is given by $c(t) = k[1 - 1.66 e^{-8t} \sin(st + 37^\circ)]$ is $100k/[s^2 + As + B]$ then $B - A =$:

- (A) 100 (B) 50
(C) 75 (D) 84

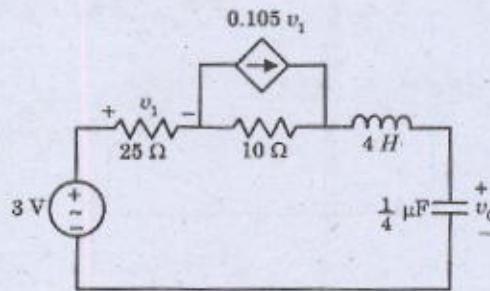
64. Two coils 1 and 2 have self and mutual inductances of displacement 'x' metres as under :
 $L_{11} = 2 + 3x, L_{22} = 4 + 6x, L_{12} = 2 - 3x$. For constant $I_1 = 1A$ and $I_2 = -0.5A$,
 an electromagnetic force is developed in the direction to increase x. The magnitude of the
 force is m, then $(10m + \frac{1}{2})$:

- (A) 3.75 (B) 37.8
 (C) 38 (D) 37.5

65. A binary PCM transmission of video signals has $f_s = 10\text{Mhz}$ and $S_x = 0.1\text{ohm}$. The
 signalling rate required to get the quantisation noise power at least 50 dB below the signal
 power is X Mbps. what is $X/4$? (f_s -sampling rate; S_x -signal power) :

- (A) 100 (B) 400
 (C) 5 (D) 25

66. The maximum voltage across capacitor would be (in V) :

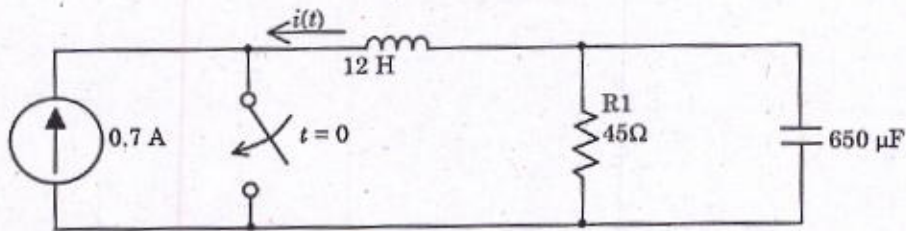


- (A) 10 (B) 300
 (C) 3200 (D) 32

67. Dual slope ADC has $R = 1K\Omega$ and $C = 0.22\text{ nF}$ has charging and discharge times for some
 voltage is 9 ns and 3 ns respectively. The reference Voltage is 2.2 V. What is the peak voltage
 reached by triangular wave during charging? (In mV)

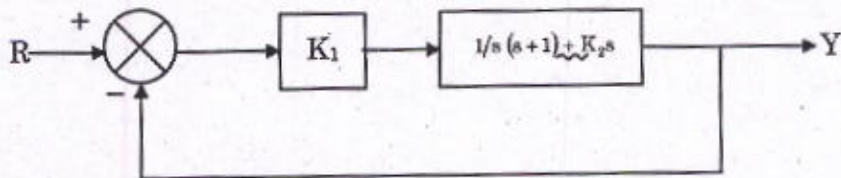
- (A) 20 mV (B) 30 mV
 (C) 40 mV (D) 10 mV

68. Calculate the value of voltage at time $t = 0.31$ seconds :



- (A) 10
(B) 9.7
(C) 10.3
(D) 8.5

69. The system in the fig. has a second order response with a damping ratio of 0.6 and a frequency of damped oscillations of 10 rad/s. The value of $4K_1 - K_2$ is :



- (A) 610
(B) 611
(C) 618
(D) 608

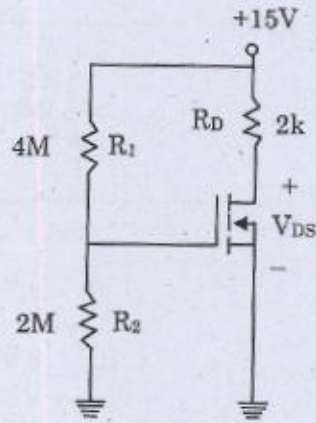
70. A transmitter radiates a total of 10 kW. The carrier is modulated to a depth of 60%. The power in the carrier will be P (in kW) then $10p$ to the nearest integer will be :

- (A) 8
(B) 9
(C) 84
(D) 85

71. A uniformly doped silicon epitaxial NPN bipolar transistor is fabricated with a base doping of $N_B = 3 \times 10^{16} \text{ cm}^{-3}$ and a heavily doped collector region with $N_C = 5 \times 10^{17} \text{ cm}^{-3}$. The neutral base width is $x_B = 0.7 \text{ um}$ when $V_{BC} = V_{BE} = 0$. The V_{BC} at punch-through is (in V) :

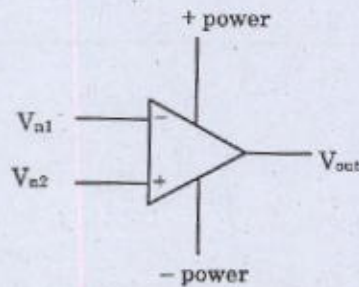
- (A) 20
(B) 22.7
(C) 15.6
(D) 18.3

72. Find the drain-source voltage, V_{DS} , for the NMOS transistor circuit shown in fig. The device parameters are : conductance parameter, $k = 600 \mu A / v^2$ and $V_T = 2 V$

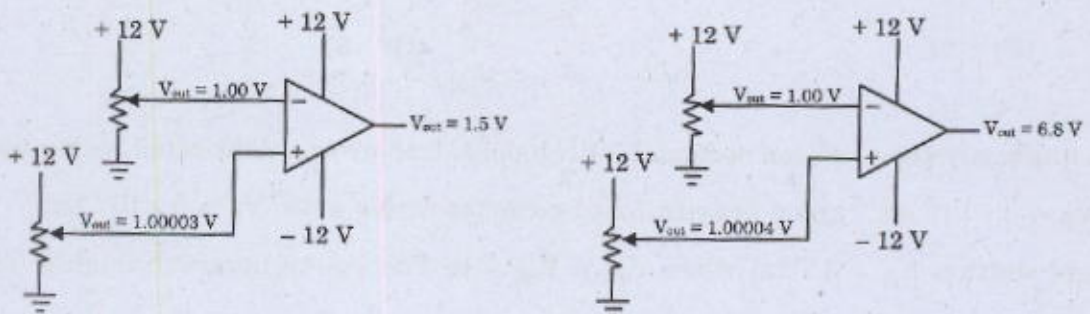


- (A) 2.5 V
(B) 3.7 V
(C) 4.2 V
(D) 4.5 V

73. An operational amplifier is a particular type of differential amplifier. Most op-amps receive two input voltage signals and output one voltage signal :

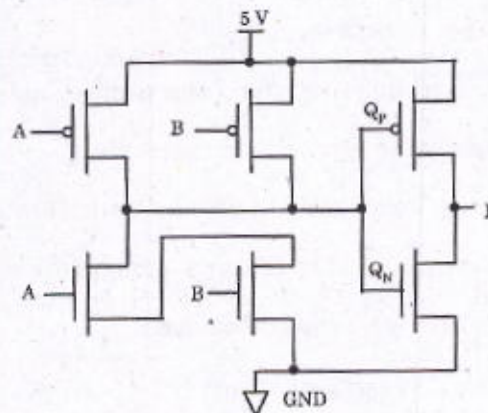


Here is a single op-amp, shown under two different conditions (different input voltages). Determine the voltage gain of this op-amp, given the conditions shown



- (A) 530000
(B) 420000
(C) 360000
(D) 120000

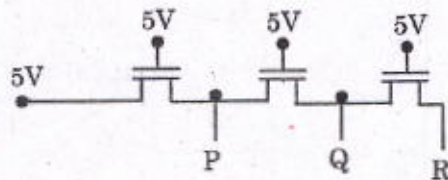
74. Let a uniform surface charge density of 5 nC/m^2 be present at the $z = 0$ plane, a uniform line charge density of 8 nC/m be located at $x = 0, z = 4$ and a point charge of $2 \mu\text{C}$ be present at $P(2, 0, 0)$. If $V = 0$ at $A(0, 0, 5)$ the V at $B(1, 2, 3)$ is : (Write your answer in Volts)
- (A) 1950 (B) 1960
(C) 1980 (D) 1970
75. Twenty-four voice signals are sampled uniformly at a rate of 8 kHz and then time-division multiplexed. The sampling process uses flat-top samples with $1 \mu\text{s}$ duration. The multiplexing operating includes provision for synchronization by adding an extra pulse of $1 \mu\text{s}$ duration. The spacing between successive pulses of the multiplexed signal is (Give the answer in ns) :
- (A) 2000 (B) 3000
(C) 4000 (D) 1000
76. Norton's theorem states that a complex network connected to a load can be replaced with an equivalent impedance :
- (A) in series with a current source
(B) in parallel with a voltage source
(C) in series with a voltage source
(D) in parallel with a current source
77. In the circuit give below, If the "on" resistance of the MOSFET labeled " Q_p " is 200Ω and the "on" resistance of the MOSFET labeled " Q_N " is 100Ω , then if 10 mA of current is sourced in the high state, V_{OH} is X . If 10 mA of current is sunk in the low state, V_{OL} is Y , then $X + Y = ?$



- (A) 5 V (B) 3 V
(C) 4 V (D) 7 V

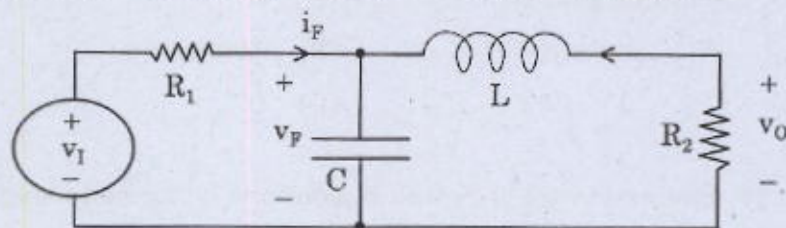
78. The discrete-time signal $x(n) = (-1)^n$ is periodic with fundamental period :
- (A) 6 (B) 4
(C) 2 (D) 0
79. At a frequency of 1 GHz and transmitter-receiver distance of 30 mi, which is the most efficient device for energy transfer :
- (A) Transmission lines (B) Wave guides
(C) Antennas (D) None of the above
80. Non-coherently detection is not possible for :
- (A) PSK (B) ASK
(C) FSK (D) BSK
81. An increase in the base recombination of a BJT will increase :
- (A) the common emitter dc current gain β
(B) the breakdown voltage BVCEO
(C) the unity-gain cut-off frequency f_T
(D) the transconductance gm
82. If the correct statements out of the ones given below are given a binary 1 and incorrect ones are assigned a 0, then the 2's compliment of the 6 bit binary number (consider first statement's assignment as least significant bit) is :
- (i) Statistical independence implies negative covariance
(ii) Group 3 MH fax code uses a form of arithmetic coding
(iii) Steven's law states that rational scales follow a logarithmic law
(iv) The Karhunen-Lo eve transform is commonly approximated by the z-transform
(v) 40 dB corresponds to an 80x increase in voltage.
(vi) The human ear has about 480 critical bands
- (A) 111111 (B) 000000
(C) 100101 (D) 011011

83. Two sequences $x_1(n)$ and $x_2(n)$ are related by $x_2(n) = x_1(-n)$. In the z -domain, their ROC's are :
- (A) the same (B) reciprocal of each other
(C) negative of each other (D) complements of each other
84. The dominant mode for waveguide operation is :
- (A) TE_{10} (B) TE_{01}
(C) TM_{01} (D) TM_{10}
85. A telephone exchange has 9000 subscribers. If the number of calls originating at peak time is 10,000 in one hour, the calling rate is :
- (A) 0.9 (B) 10/9
(C) 0.81 (D) 0.1
86. In CMOS technology, shallow P-well or N-well regions can be formed using :
- (A) low pressure chemical vapour deposition
(B) low energy sputtering
(C) low temperature dry oxidation
(D) low energy ion-implantation
87. In the following circuit employing pass transistor logic, all NMOS transistors are identical with a threshold voltage of 1 V. Ignoring the body-effect, if the output voltages at P , Q and R are p , q and r then $p + q - r = ?$

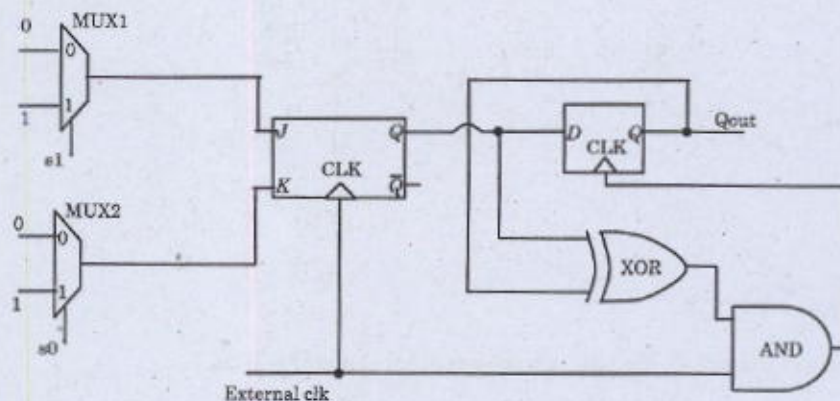


- (A) 3 (B) 4
(C) 2 (D) 5
88. The system characterized by the equation $y(t) = ax(t) + b$ is :
- (A) linear for any value of b (B) linear if $b > 0$
(C) linear if $b < 0$ (D) non-linear

89. Ridged waveguides are advantageous over rectangular waveguides in their :
- (A) Attenuation (B) Cost
(C) Easy of construction (D) Ability to work at lower frequency
90. A 1000 kHz carrier is simultaneously modulated with 300 Hz, 800 Hz and 2 kHz audio sine waves. Which of the following frequency is least likely to be present in the output?
- (A) 1002 kHz (B) 1000 kHz
(C) 999.2 kHz (D) 998.0 kHz
91. Calculate the relation for V_o / V_i for this network. Write the answer up to 4 decimal places. Given $L = 1 \text{ mH}$, $R_1 = 1 \text{ K}\Omega$, $R_2 = 2 \text{ K}\Omega$, $C = 1 \text{ nF}$, $\omega = 1 \text{ MHz}$:



- (A) 0.2857 (B) 0.3256
(C) 0.2905 (D) 0.3568
92. In the following circuit s_0 , s_1 and External Clock are the inputs to the circuit, with External clock, s_0 , and s_1 as square pulses of time periods having a ratio of 1 : 2 : 4. Taking time period of the External clock as 1 s, find Q_{out} at $t = 2s$, 4s, 6s, 8s and 10s. Give your answer as Q_{out} for the specified time in the order given without spaces. (Assume Q_{out} , s_0 , s_1 , External clock = 0 at $t = 0$) :



- (A) 00001 (B) 10000
(C) 01000 (D) 00100

93. The FT of a rectangular pulse existing between $t = -T/2$ to $t = T/2$ is a :

- (A) sinc squared function (B) sinc function
(C) sine squared function (D) sine function

94. When the length of antenna is a whole wavelength :

- (A) the radiation at right angles is zero
(B) the radiation at right angles is maximum
(C) the radiation is zero in all directions
(D) the radiation is maximum in all directions

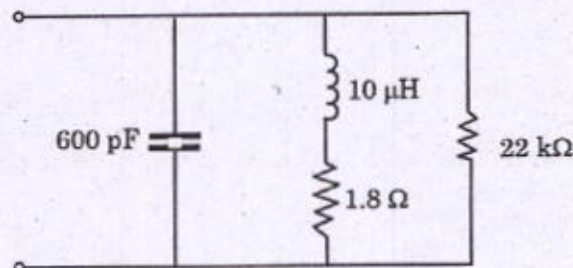
95. Consider the following statements :

1. The amplitude of an FM wave is constant
2. FM is more immune to noise than AM
3. FM broadcasts operate in upper VHF and UHF frequency ranges
4. FM transmitting and receiving equipments are simpler as compared to AM transmitting and receiving equipments

Which of the above are correct?

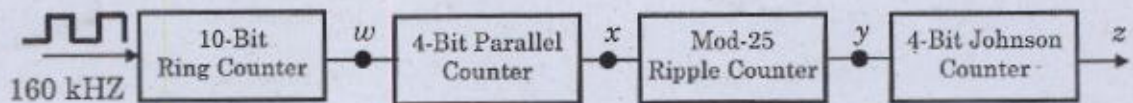
- (A) 1, 2, 3, 4 (B) 1, 2, 3
(C) 2, 3, 4 (D) 1, 3, 4

96. Find the resonating frequency of the circuit in MHz :



- (A) 205 (B) 195
(C) 190 (D) 200

97. Find the frequency at the point z in Hz :



- (A) 2 (B) 4
(C) 5 (D) 10

98. The Fourier transform of the exponential signal $e^{j\omega_0 t}$ is :

- (A) a constant (B) a rectangular gate
(C) an impulse (D) a series of impulses

99. Assertion (A) : The maximum range of a radar is proportional to fourth root of the peak transmitted pulse power.

Reason (R) : Radar signals are subjected twice to inverse square law.

- (A) Both (A) and (R) are correct and (R) is correct explanation of (A)
(B) Both (A) and (R) are correct but R is not correct explanation of (A)
(C) (A) is correct but (R) is wrong
(D) (A) is wrong but (R) is correct

100. Assertion (A) : Free space does not interfere with normal radiation and propagation of radio waves.

Reason (R) : Free space has no magnetic or gravitational fields.

- (A) Both (A) and (R) are correct and (R) is correct explanation of (A)
(B) Both (A) and (R) are correct but (R) is not correct explanation of (A)
(C) (A) is correct but (R) is wrong
(D) (A) is wrong but (R) is correct