ELECTRONICS & TELECOMMUNICATION ENGINEERING

PAPER – II

1. The root loci of a feedback control system for large values of s are asymptotic to the straight lines with angles 0 to the real axis given by which one of the following?
(Where p = Number of finite poles of G(s)H(s), z = Number of finite zeros of G(s) H(s) and k = 0, 1, 2, …..)
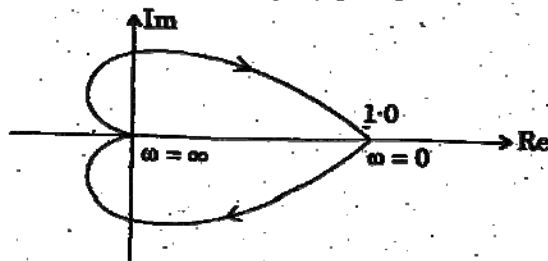
   a. $\dfrac{(p-z)\pi}{2k+1}$

   b. $\dfrac{(2k+1)\pi}{p-1}$

   c. $2k(p-z)$

   d. $\dfrac{2k}{p}z$

2. The forward path transfer function of a unity feedback system is given by

   $G(s) = \dfrac{100}{s^2 + 10s + 100}$

   The frequency response of this system will exhibit the resonance peak at
   a. 10 rad/s
   b. 8.66 rad/s
   c. 7.07 rad/s
   d. 5 rad/s

3. Consider the following Nyquist plot

   With which one of the following transfer functions, does the above Nyquist plot match?

   a. $\dfrac{1}{(s+1)^3}$

   b. $\dfrac{1}{(s+1)^2}$

   c. $\dfrac{1}{(s^2+2s+2)}$

   d. $\dfrac{1}{(s+1)}$

4. The forward path transfer function of a unity feedback system is given by $G(s) = \dfrac{1}{(1+s^2)}$. What is the phase margin for this system?
   a. $-\pi$ rad
   b. 0 rad
   c. $\pi/2$ rad
   d. π rad

5. All the constant N-circles in G-planes cross the real axis at me fixed points. Which are these points?
   a. -1 and origin
   b. origin and + 1
   c. - 0.5 and + 0.5
   d. - 1 and + 1

6. What is the value of M for the constant M circle represented by the equation
   $8x^2 + 18x + 8y^2 + 9 = 0$, where
   $x = \text{Re}\,|G(j\omega)|$ and $y = \text{Im}_\lambda\,|G(j\omega)|$?
   a. 0.5
   b. 2
   c. 3
   d. 8

7. Which one of the following statements is correct?
   A plant is controlled by a proportional controller. If a time delay element is introduced in the loop, its
   a. phase margin remains the same
   b. phase margin increases
   c. phase margin decreases
   d. gin margin increases

8. Which one of the following statements is correct?
   The effects of phase lead compensator on gain cross-over frequency (ω_{cg}) and the bandwidth (BW) are,
   a. that both are decreased
   b. that ω_{cg} is decreased but BW is increased

c. that ω_{cg} is increased but BW is decreased

d. that both are increased

9. How does cascading an integral controller in the forward path of a control system affect the relative stability (RS) and the steady-state error (SSE) of that system?

a. Both are increased
b. RS is reduced but SSE is increased
c. RS is increased but SSE is reduced
d. Both are reduced

10. Consider the following statements for phase-lead compensation

1. Phase-lead compensation shifts the gain cross-over frequency to the right.
2. The maximum phase-lead angle occurs at the arithmetic mean of the corner frequencies of the phase-lead network.
3. Phase-lead compensation is effective when the slope of the uncompensated system near the gain cross-over is low.

Which of the statements given above are correct?

a. 1, 2 and 3
b. 1 and 2
c. 2 and 3
d. 1 and 3

11. A ternary source produces alphabets A, B and C with probabilities $p_A = p_B = p$ and p_c. Which one of the following gives the correct values for the maximum value of the entropy of the source; and the corresponding value of p and the range of p?

a. 1.58, 0.33, (0, 0.5)
b. 1.0, 0.5, (0, 1)
c. 3.0, 0.67, (0, 0.5)
d. 2.0, 4.2, (0, 0.3)

12. In a BPSK signal detector, the local oscillator has a fixed phase error of 20°. By what factor does this phase error deteriorate the SNR at the output?

a. $\cos^2 20°$
b. $\cos 20°$
c. $\cos 40°$
d. $\cos 70°$

13. Which one of the following is represented by

$v(t) = 5\left[\cos(10^6 \pi t) - \sin(10^3 \pi t) \times \sin(10^6 \pi t)\right]$

a. SSB under sideband signal
b. DSB suppressed carrier signal

c. AM signal
d. Narrow band FM signal

14. Which one of the following statements is correct? In a radio detector

a. linearity is worse than that of a phase discriminator
b. stabilization is provided against signal strength variations
c. the output is twice of that obtainable from a similar phase discriminator
d. the circuit is same as that in a discriminator, except that the diode connections are reversed

15. Consider minimum shift keying (MSK) also known as last FSK with frequency spacing 2 f_d between the state frequencies. r_b is the data rate. Which one of the following correctly relates r_b and f_d?

a. $f_d = r_b / 4$
b. $f_d = r_b / 2$
c. $f_d = 3r_b / 4$
d. $f_d = r_b$

16. In a broadcast transmitter, the RF output is represented as

$e(t) = 50\left[1 + 0.89\cos 5000t + 0.30\sin 9000t\right]$
$\cos(6 \times 10^{10} t)$ volt

What is the SNR improvement with FSK over ASK in most types of noise environment?

a. 200 to 300 dB
b. 3 to 4 dB
c. 10 to 12 dB
d. 0 dB

17. What is the SNR improvement with FSK over ASK in most types of noise environment?

a. 200 to 300 dB
b. 3 to 4 dB
c. 10 to 12 dB
d. 0 dB

18. The sum of two signals $e_1 = 3\sin(4\pi \times 10^3 t)$ and $e_2 = 5\sin(2\pi \times 256t)$ is sampled at 1024 Hz. The sampled signal is passed through a low pass filter with cut off at 2048 Hz. The output of this filter will contain components at

a. 256 Hz and 10^3 Hz
b. 256 Hz and 1024 Hz

c. 256 Hz only

d. 1024 Hz only

19. Consider the following circuit of a scrambler:
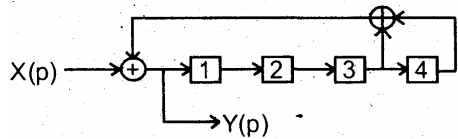
$X(p) \triangleq$ input data stream polynomial

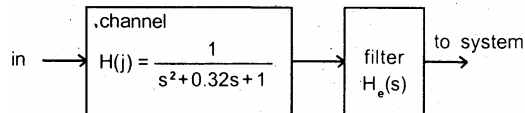$Y(p) \triangleq$ output data stream polynomial

$\square's \triangleq$ shift-register stages

$\oplus's \triangleq$ OXR gates

Which one of the following relates X(p) and Y(p)?

a. $Y(p) = X(p) / \left[p^4 + p^3 + 1 \right]$

b. $Y(p) = p^4 X(p) / \left[p^4 + p^3 + 1 \right]$

c. $Y(p) = X(p) / \left[p^4 + p + 1 \right]$

d. $Y(p) = p^4 X(p) / \left[p^4 + p + 1 \right]$

20. A filter at the input to a processing system is shown in the diagram given below:

The channel works for toll quality telephone use. If the filter $H_e(S)$ is to be designed so that linear distortion is minimized, then $H_e(S)$ should have which one of the following?

a. Constant delay

b. Constant phase

c. Inverse relationship with H(s)

d. Inverse relationship with H(s) and constant delay

21. What is the responsivity of a photodiode having a quantum efficiency of 65% with photons of energy 1.5×10^{-19} J incident upon it?

a. $0.832\ AW^{-1}$

b. $0.714\ AW^{-1}$

c. $0.694\ AW^{-1}$

d. $0.452\ AW^{-1}$

22. The normalized frequency of a step index fibre is 28 at 1300 nm wavelength. What is the total number (approximately) of guided modes that can be supported by the fibre?

a. 50

b. 200

c. 400

d. 800

23. What is the beam width of a pyramidal horn antenna with aperture dimension of 9 cm × 8 cm and operating at a frequency of 5 GHz?

a. 7.2°

b. 10°

c. 15°

d. 16.4°

24. Match List I (Designation of Radar Frequencies) with List II (Frequency. Range) and select the correct answer:

List I

A. S

B. X

C. Ku

D. K

List II

1. 18 - 26.5 GHz

2. 2 - 4 GHz

3. 8 - 12.4 GHz

4. 12.4 - 18 GHz

Codes;

	A	B	C	D
a.	1	3	2	4
b.	1	4	2	3
c.	2	3	1	4
d.	2	4	1	3

25. Which one of the following statements is correct?

Microwave link repeaters are typically 50 km apart

a. because of atmospheric attenuation

b. because of output tube power limitations

c. because of earth's curvature

d. to ensure that the applied d.c. voltage is not excessive

26. Match List I with List II and select the correct answer using the codes given below

List I

A. Deviative absorption

B. Non-deviative absorption

C. Atmospheric noise

D. Unabsorbed field strength

List II

1. Depends on thunderstorms

2. Depends on the region of the ionosphere where the wave is bent back to earth
3. Depends on D-layer region where the collision frequency is high
4. Is less than inverse distance attenuation

Codes;

	A	B	C	D
a.	2	4	1	3
b.	2	3	1	4
c.	1	4	2	3
d.	1	3	2	4

27. Consider the following statement
Electromagnetic waves are refracted when they
1. pass through a medium of different permittivity
2. pass through a small slot in a dielectric slab
3. are incident on a perfectly conducting surface

Which of the statements given above is/are correct?
a. 1 only
b. 2 only
c. 3 only
d. 1 and 3

28. In parametric amplifiers used in microwave communication systems, the pump energy mainly restricts which one of the following?
a. Bandwidth
b. Gain
c. Noise level
d. Operating frequency

29. Which one of the following techniques is not suitable for automatic satellite tracking?
a. Monopule
b. Step-track
c. Conical scanning
d. Lobe switching

30. What is the octal equivalent of decimal 0.3125?
a. 0.42
b. 0.3125
c. 0.24
d. 0.12

31. How many l's are present in the binary representation of
$(4 \times 4096) + (9 \times 256) + (7 \times 16) + 5$?

a. 8
b. 9
c. 10
d. 11

32. Given three integer variables a, b, c where each one will take positive value. Which one of the following expressions in C avoids overflow?
a. $a + b + c$
b. $b + a - c$
c. $b - c + a$
d. $c + a + b - c - c$

33. x.: = 1; y: = 0;
while y < k do
begin
x: = 2 * x;
y : y + 1
end;

For the above Pascal program fragment involving integers x, y, and k, which one of the following is a loop invariant; i.e. true at the beginning of each execution of the loop and at the completion of the loop?
a. $x = 2y$
b. $x = y + 1$
c. $x = (y + 1)^2$
d. $x = (y + 1)2^y$

34. Consider the following 'C' program;
main( )
{
pri ( ); pri ( ); pari ( )
}
pri ( )
{
            static int k;
print {"%d", ++k);
}

Which one of the following is correct in respect of the program given above?
a. It prints 012
b. It prints 123
c. It prints 111
d. It prints 3 consecutive but unpredictable numbers

35. Consider a complete graph with n vertices. What is the total number of spanning trees?
a. $\dfrac{n(n-1)}{2}$
b. $2n - 1$
c. $n!$

d. n^{n-2}

36. It is given that two pointer variables p and q are of the same type and p < q. Which one of the following operations is logically not correct?
   a. p - q
   b. p + q
   c. p + 5
   d. p^{++}

37. Match List I (Type of Data Structure) with List II (Used in Application) and select the correct answer:
   List I
   A. Stack
   B. Tree
   C. Record
   D. Array
   List II
   1. Solving linear simultaneous equation
   2. Subroutine linkage
   3. File processing
   Codes;

	A	B	C	D
a.	3	4	2	1
b.	2	1	3	4
c.	2	4	3	1
d.	3	1	2	4

38. Which one of the following is not a correct reason for biasing the laser near but below threshold in the off state for a laser drive circuit?
   a. It reduces the switch-on delay
   b. It allows easy compensation for changes in ambient temperature
   c. It eliminates the spontaneous emission of light in the off state
   d. It reduces the junction heating caused by the digital drive current

39. Which one of the following statements is correct? The modal noise in multimode fibres cannot be reduced by
   a. use of a broad spectrum source
   b. using fibres having large numerical apertures
   c. phase correlation between the modes
   d. use of a single mode fibre

40. What should be the frequencies used for communication inside the coal mines, from the viewpoint of minimizing the propagation path loss?
   a. In the range from 30 MHz to 400 MHz
   b. En the range from 1 GHz to 4 GHz
   c. In the range from 500 MHz to 1 GHz
   d. In the range from 1 GHz to 2 GHz

41. Which one of the following statements is correct?
   Digital modulation techniques are used in satellite communication systems since
   a. they are easier to handle
   b. large bandwidth utilization is possible
   c. they have a higher spectral efficiency
   d. they are less prone to interference

42. Which one of the following statements is not correct?
   a. A geo-synchronous satellite remains practically stationary relative to earth antennas
   b. A geo-synchronous satellite means the same thing as geo-stationary satellite
   c. There is a trade-off between the cost of a communication satellite and cost of its earth stations
   d. Three geo-synchronous satellites cannot give 100% global coverage

43. Consider the following statements
   A traveling wave tube is a
   1. broad-band amplifier
   2. Linear beam amplifier
   3. crossed field amplifier
   4. solid-state amplifier
   Which of the statements given above re correct?
   a. 1 and 2
   b. 2 and 4
   c. 2 and 3
   d. 1, 3 and 4

44. In a Ga As gunn diode the drift velocity is 10^7cm/s and active region length is 10^{-3} cm. What is the natural frequency of oscillation?
   a. 8 GHz
   b. 9 GHz
   c. 10 GHz
   d. 11 GHz

45. Consider the following pairs:
   1. Travelling wavetube: Linear electron beam
   2. Cavity Magnetron: Strapping
   3. Amplitron: CFA
   Which of the pairs given above are correctly matched?
   a. 1, 2 and 3
   b. 1 and 2
   c. 2 and 3

d. 1 and 3

46. A rectangular waveguide operating in the dominant mode is gradually deformed into circular cross-section in the direction of propagation. What is the mode at the output?
   a. TM_{11}
   b. TE_{11}
   c. TE_{01}
   d. TM_{01}

47. A "mode filter" has the structure of thin radial wires in a circular waveguide as shown in the diagram given below:
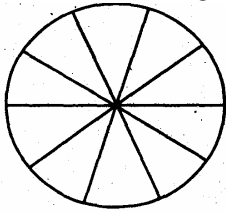
   Which one of the following modes is filtered out by the above mode filter?
   a. TE_{01}
   b. TM_{01}
   c. TE_{11}
   d. TM_{11}

48. A 4-port microwave passive device has scattering matrix of the form

$$\begin{bmatrix} 0 & p & 0 & jq \\ p & 0 & jq & 0 \\ 0 & jq & 0 & p \\ jq & 0 & p & 0 \end{bmatrix}$$

   Which one of the following statements is correct?
   The device is a
   a. Hybrid Tee
   b. Hybrid ring
   c. H-port circulator
   d. Directional coupler

49. It is given that the first roots of $J_1(x) = 0$ and $J_1'(x) = 0$ are 3.83 and 1.84 respectively. Which one of the following gives the cut off wavelength of TM_{11} mode in a circular waveguide of diameter D?
   a. $\lambda_c \simeq 0.64D$
   b. $\lambda_c \simeq 0.82D$
   c. $\lambda_c \simeq D$
   d. $\lambda_c \simeq 1.2D$

50. A 50 ohm coaxial line is connected to a 72 ohm load through a 60 ohm coaxial section of length 7.5 mm. What is the input VSWR on the line if it is fed by a 20 GHz source?
   a. 1.0
   b. 1.25
   c. 1.33
   d. 1.44

51. Match List I with List II and select the correct answer using the codes given below
   List I
   A. Helical antennas
   B. Dipole
   C. Parabolic dish
   D. Array antennas
   List II
   1. Isotropic radiator
   2. Circularly polarized radiation
   3. Shaped beams
   4. Satellite communication systems
   Codes;

	A	B	C	D
a.	1	2	4	3
b.	1	2	3	4
c.	2	1	4	3
d.	2	1	3	4

52. Match List I with List II and select the correct answer using the codes given below:
   List I
   A. Cavity wave meter
   B. Magic Tee
   C. VSWR
   D. Bolometer
   List II
   1. Microwave component
   2. Microwave power measurement
   3. Microwave frequency measurement
   4. Reflection coefficient measurement
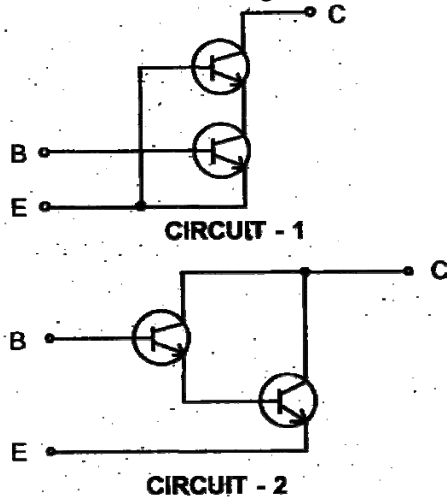   Codes;

	A	B	C	D
a.	1	2	4	3
b.	1	2	3	4
c.	2	1	4	3
d.	2	1	3	4

53. Two one-port cavity resonators having coupling coefficients K_1 and K_2 and identical resonant frequency $\omega 0$ produce identical VSWR when used as terminating loads of waveguide. Which one of the

following relations is satisfied by K_1 and K_2?

a. $K_1 - K_2 = 0$

b. $K_1 K_2 = 0$

c. $K_1 K_2 = 1/2$

d. $K_1 + K_2 = 1$

54. Consider the following circuits:

CIRCUIT - 1

CIRCUIT - 2

Which one of the following statements is correct?

a. Circuit 1 is parallel connection and Circuit 2 is Darlington connection

b. Circuit 1 is cascade connection and Circuit 2 is Darlington connection

c. Circuit 1 is Darlington connection and Circuit 2 is cascade connection

d. Circuit 1 is cascade connection an& Circuit 2 is parallel connection

55. An amplifier has a d.c. power supply of 15 V and draws a current of 10 mA. It produces an output of 5 V peak across a load resistance of 600Ω for a signal frequency of 1 kHz. What will be its a.c. power output?

a. 260 mW

b. 20.8 mW

c. 520 mW

d. 40.6 mW

56. The transfer function of a transistor amplifier is given by

$$A_v = \frac{V_0}{V_s} = \frac{4240}{\left(1 + j\frac{f}{4 \times 10^5}\right)\left(1 + j\frac{f}{4 \times 10^6}\right)}$$

Which one of the following gives the approximate upper 3-dB frequency f_H^* of the amplifier?

a. $4 \times 10^5 \, Hz$

b. $2.2 \times 10^6 \, Hz$

c. $4 \times 10^6 \, Hz$

d. $4.4 \times 10^6 \, Hz$

57. Which one of the following is a wide-band amplifier?

a. RF amplifier

b. IF amplifier

c. Video amplifier

d. AF amplifier

58. Consider the following statements:

In JFET amplifiers, high frequency response can be improved by using peaking circuits containing inductors

1. in series with drain resistanceR0

2. in series with the coupling capacitance.

3. as a feedback element between drain and gate.

Which of the statements given above are correct?

a. 1 and 2

b. 2 and 3

c. 1 and 3

d. 1, 2 and 3

59. Which one of the following statements is correct?

If in a double-tuned voltage amplifier, the mutually coupled secondary and primary are synchronously tuned with equal Q-values then for the over-coupled case the maximum voltage amplification

a. is greater than that for critical coupling and the amplifier characteristic is double peaked

b. is less than that for critical coupling and the amplifier characteristic has a single peak

c. is same as that for critical coupling and the amplifier characteristic is double peaked

d. is less than that for critical coupling and the amplifier characteristic is doubled peaked

60. A tuned amplifier has a voltage gain of 100 and a band width of 10 kHz at 500 kHz. It is required to increase the bandwidth to 20 kHz. This can be achieved by which one of the following ways?

a. By doubling the gain

b. By doubling the resonant frequency

c. By halving the Q of the coil
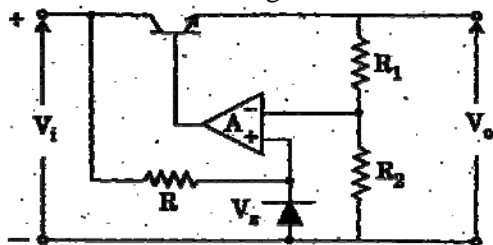
d. By halving the power supply voltage

61. A d.c. to d.c. converter has an efficiency of 80% and is supplying a load of 24 W at 240 V. What is the current drawn from the battery if the converter is working from a battery of 12 V?
   a. 0.1 A
   b. 2.0 A
   c. 2.5 A
   d. 10 A

62. Consider the following circuit:
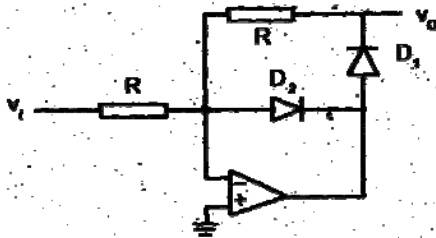
What is the function of diode D_2 in the above circuit?
   a. To avoid saturation of the Op-Amp
   b. To provide negative feedback when the input is negative
   c. To reduce reverse breakdown voltage of D_1
   d. As a buffer
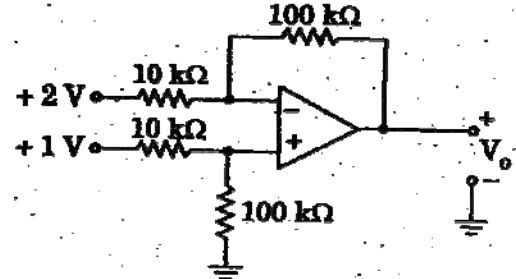
63. Consider the following circuit:

Which on of the following expressions for V_0 is correct?

   a. $V_0 = V_z\left(\dfrac{R_1 + R_2}{R + R_1 + R_2}\right)$
   b. $V_0 = AV_z$
   c. $V_0 = V_z\left(1 + \dfrac{R_1}{R_2}\right)$
   d. $V_0 = AV_z\left(\dfrac{R_1 + R_2}{R + R_1 + R_2}\right)$

64. Which one of the following statements is not correct in respect of a series transistor feedback voltage regulator?
   a. The regulation factor can be improved by increasing the h_{fe} of the shunt transistor
   b. The regulation factor can be improved by increasing the resistance between the collector of the shunt transistor and the collector of the series, transistor
   c. Output resistance can be reduced by using a Darlington pair in place of the series transistor
   d. Output resistance can be reduced by reducing the h_{fe} of the shunt transistor
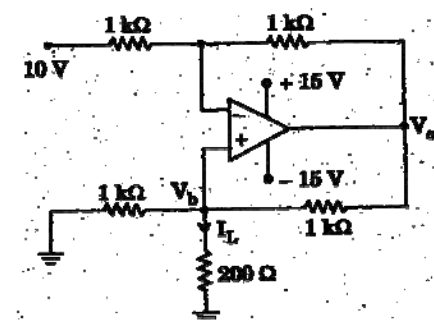
65. Consider the following Op-Amp circuit

What is the output voltage V_o in the above Op-Amp circuit?
   a. + 10 V
   b. – 10 V
   c. + 11 V
   d. – 11 V

66. Consider the following circuit:
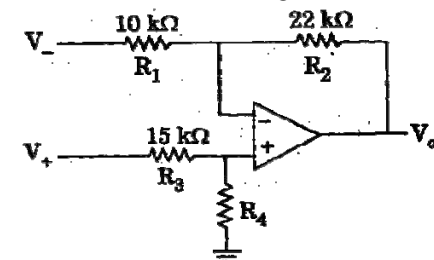
What is the value of R_4 in the above circuit, if the voltage V_- and V_+ are to be amplified by the same amplification factor?
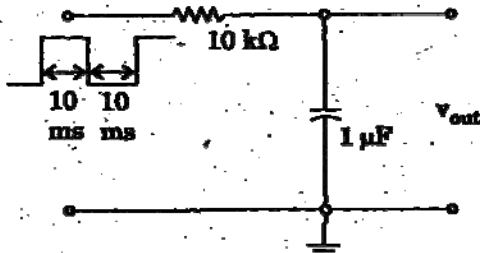   a. 7 kΩ
   b. 22 kΩ
   c. 33 kΩ
   d. 35 kΩ

67.

What is the load current I_L in the above circuit?
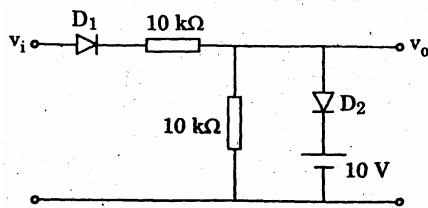   a. – 5 mA

b. -10 mA

c. $+25$ mA

d. $+50$ mA

68. A 50 Hz symmetric square wave is applied to the RC-circuit shown in the diagram given below.

Which one of the following is the correct shape of the output waveform?

a.

b.

c.

d.

69. Consider the following circuit:

For the circuit shown above, which one of the following is a correct statement?

a. D_2 does not conduct for any value of V_i

b. v_o 10 V for all values of $v_i > 10$ V

c. $v_o = 0$ V for all values of $v_i < 0$ V

d. $v_o = 10$ V for all values of $v_i > 0$ V

70. What is the depth of a complete binary tree with 'n' nodes?

a. $\log_2(n+1)-1$

b. $\log_2(n-1)+1$

c. $\log_2(n)+1$

d. $\log_2(n)-1$

71. A disc drive has an average seek time of 10 ms, 32 sectors on each track and 512 bytes per sector. If the average time to read 8 kbytes of continuously stored data is 20 ms, what is the rotational speed of the disc drive?

a. 3600 rpm

b. 6000 rpm

c. 3000 rpm

d. 2400 rpm

72. Given a 32-bit processor with 16 MB main memory, 32 kB 4-way set-associative on-chip cache and a cache block size (or line size) of 16 words. What is the total number of tag bits in the memory address format?

a. 9

b. 20

c. 11

d. 24

73. Match List I with List II and select the correct answer:

List I (Characteristic)

A. Micro-code for several instructions

B. Lack of indirect addressing

C. Presence of on-chip cache

D. Simple optimizing compiler

List II (Processor Architecture)

1. Both RISC and CISC

2. CISC only

3. Neither RISC nor CISC

4. RISC only

Codes;

	A	B	C	D
a.	2	4	1	3
b.	1	3	2	4
c.	2	3	1	4
d.	1	4	2	3

74. A disc drive has a rotational speed of 3600 rpm, an average seek time of 10 ms, 64 sectors per track and 512 bytes of data per sector: What is the average time to access the entire data, of a 16 kbytes file stored sequentially on the disk?

a. 18.85 ms

b. 10 ms

c. 27.15 ms

d. 9 ms

75. A particular parallel program computation requires 100 seconds when executed on a single processors If 40 percent of this computation is 'inherently sequential', then what are the theoretically best elapsed times for this program running with 2 and 4 processors, respectively?
    a. 20 and 10 seconds
    b. 30 and 15 seconds
    c. 50 and 25 seconds
    d. 70 and 55 seconds

76. Consider the following statements
    The advantage of cycle stealing in DMA is that
    1. it increases the maximum I/O transfer rate
    2. it reduces the interference by the DMA controller in the CPU's memory access
    3. it is beneficially employed for I/O devices with shorter bursts of data transfer
    Which of the statements given above are correct?
    a. 1 and 2
    b. 1 and 3
    c. 2 and 3
    d. 1, 2 and 3

77. Consider a hypothetical processor with largest instruction length being 32-bit and 16 registers R_0 - R_{15}. Processor supports only following instructions
    ADD   Ri, Rj
    SUB   Ri, Rj
    AND   Ri, Rj
    NOT   Ri
    MOV   Ri, Rj
    LOAD   Address   // Loads with register R_0
    STORE   Address   // Stores the content of R_0
    JUMP   Address
    J Z   Address
    What is the maximum number of address pins on this processor?
    a. 27
    b. 28
    c. 29
    d. 30

78. Consider the following statements :
    The 8085 microprocessor will not enter into bus idle machine cycle whenever
    1. INTR interrupts is recognized

    2. RST x.5 is recognized
    3. DAD rp instruction is executed
    Which of the statements given above is/are correct?
    a. 1 only
    b. 2 only
    c. 1 and 2
    d. 2 and 3

79. Consider the following program:
    ```
              ORG        7000 H
    BEGIN:    LXI        H, 7000 H
              MOVE       A,L
              ADD        H
              JM         END
              RST        0
    ENDS:     PCHL
              HLT
    ```
    Which one of the following statements is correct?
    a. The program will halt the processor
    b. The program will be repeated infinitely
    c. The program will branch to 0007 H after JM END
    d. The program will branch to 0000 H after JM END

80. Consider the following program intended to transfer a block of 5 bytes from A000H to 9000H
    ```
    START:    LXI    B, 9000 H
              LXI    H, A000H
              MVI    C, 05H
    LOOP:     MOV    A, M
              STAX   B
              INX    B
              INX    H
              DCR    C
              JNZ    LOOP
              HLT
    ```
    The above program will not work because
    a. C Register is used as counter
    b. OCR C instruction will not 'affect zero flag
    c. JNZ instruction is used instead of JZ
    d. The first two instructions in loop should have been LDAX D and MOV M, A

81. Which is the most common antenna to obtain a predetermined, radiation pattern?
    a. Array antenna
    b. Corner reflector
    c. Sectoral horn
    d. Helical antenna

82. Assertion (A): In a transistor switching circuit, it is desirable that the transistor should not be driven into hard saturation for fast switching applications.

Reason (R): When a transistor is under saturation state, both its emitter-base and collector-base junctions' remain under forward bias.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

83. Assertion (A): In the error detector configuration using a synchro transmitter and synchro control transformer, the latter is connected to the error amplifier.

Reason (R): Synchro control transformer has almost a uniform reluctance path between the rotor and the stator

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

84. Assertion (A): The error detector in a position control system using synchro pairs employs synchro transmitter for reference signal and synchro control transformer for the feedback signal.

Reason (R): Synchro control transformer rotor has a uniform magnetic reluctance.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

85. Assertion (A): The number of branches of root locus terminating on infinity is equal to the number of open loop poles minus the number of zeros.

Reason (R): Segment of the real axis having an odd number of real axis open loop poles plus zeros to their right are parts of the root locus:

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false

d. A is false but R is true

86. Assertion (A): The bandwidth of a control system indicates the noise filtering characteristic of the system.

Reason (R): The bandwidth is a measure of ability of a control system to reproduce the input signal.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

87. Assertion (A): AM stereo broadcasting uses quadrature carrier multiplexing (QAM)

Reason (R): QAM involves more stringent synchronization than an FDM system with SSB sub-carrier modulation.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

88. Assertion (A): Juxtapaposition or bit-stuffing is encountered in asynchronous multiplexing.

Reason (R): The data rate at the output of a coaxial line change because of the change in the velocity of the propagating wave.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

89. Assertion (A): For a slow wave structure, helix is a broadband low—power device while coupled—cavity chain is a narrow band high-power device.

Reason (R): A helix is a good dissipator of power, while a coupled cavity structure is poor for high power dissipation.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

90. Assertion (A): In free-space transmission between a transmitting and a receiving

antenna, a high frequency wave decreases more rapidly in magnitude than a low frequency wave.

Reason (R): For a given gain, the aperture of a high frequency antenna is smaller than that of a low frequency antenna.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

91. Assertion (A): The DMA technique is more efficient than the Interrupt-driven technique for high volume I/O data transfer.

Reason (R): The DMA technique does not make use of the Interrupt mechanism.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

92. Consider the following circuit
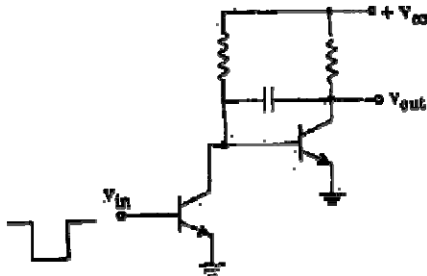
What is the circuit shown above?
a. Miller sweep
b. Bootstrap sweep
c. Schmitt trigger
d. Triangular wave generator

93. Match List I with List II and select the correct

List I (Application of the Circuit)
A. Divider
B. Clips input voltage at two predetermined levels
C. Square wave generator
D. Narrow current pulse generator

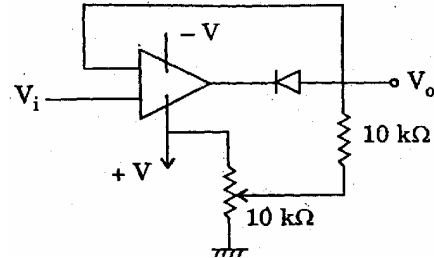List II (Circuit Name)
1. Astable multivibrator
2. Schmitt trigger
3. Bistable multivibrator.
4. Blocking oscillator

Codes;

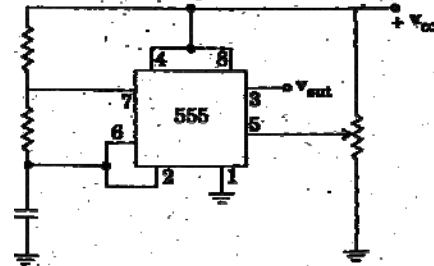|	A	B	C	D
a.	4	2	1	3
b.	3	2	1	4
c.	4	1	2	3
d.	3	1	2	4

94. Consider the following circuit:

How does the above circuit work?
a. As a logarithmic amplitier
b. As a negative clipper
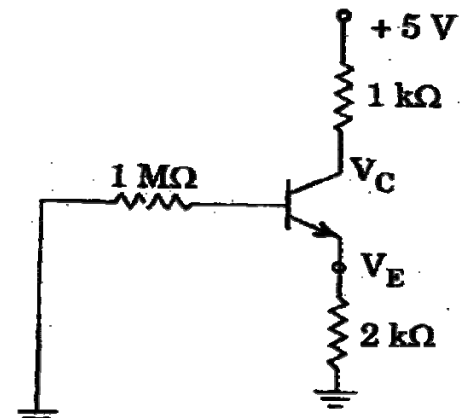c. As a positive clipper
d. As a half-wave rectifier

95. Consider the following circuit:

What is the type circuit of given above?
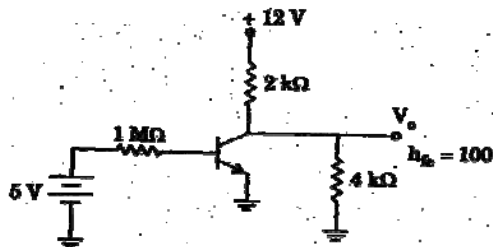a. Monostable
b. Ramp generator
c. VCO
d. Bistable multivibrator

96. Consider the following circuit:

What is voltage difference between collector and emitter (V_{CE}) in the above circuit?
a. 10/3 V
b. 0 V
c. 5 V
d. 3 V

97. Consider the NPN transistor circuit shown below:

What if the output voltage V_0 in the above circuit?

a. 0 V
b. 12 V
c. 9 V
d. 5 V

98. Assume that only x and y logic inputs are available, and their complements $\bar{x}$ and $\bar{y}$ are not available. What is the minimum number of 2-point NAND gates required to implement x

a. 2
b. 3
c. 4
d. 5

99. A, B and C are three Boolean variables. Which one of the following Boolean expressions cannot be minimized any further?

a. $Z = A.\bar{B}.\bar{C} + A.B.\bar{C} + A.B.C + \bar{A}.\bar{B}.\bar{C}$
b. $Z = A.\bar{B}.C + A.B.\bar{C} + A.B.C + \bar{A}.\bar{B}.\bar{C}$
c. $Z = A.\bar{B}.\bar{C} + \bar{A}.\bar{B}.C + A.B.C + \bar{A}.B.\bar{C}$
d. $Z = \bar{A}.B.\bar{C} + \bar{A}.B.\bar{C} + A.B.C + \bar{A}.B.\bar{C}$

100. What is the minimum number of NAND gates required to implement $A + A\bar{B} + A\bar{B}C$?

a. 0
b. 1
c. 4
d. 7

101. Match List I (Logic Gates) with List II (Characteristics) and select the correct answer using the codes

List I
A. HTL
B. CMOS
C. I²L
D. ECL

List II
1. High fan-out
2. Highest speed of operation

3. High noise immunity Lowest product of power and delay

Codes;

|	A	B	C	D
a.	3	2	4	1
b.	4	2	3	1
c.	3	1	4	2
d.	4	1	3	2

102. Consider the following logic circuit
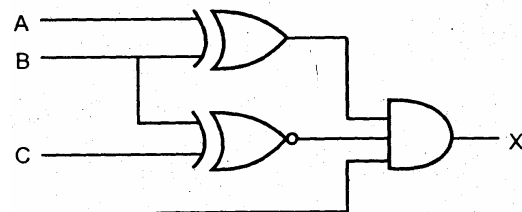
What is the required input condition' (A, B, C) to make the output X = 1, for the above logic circuit?

a. (1, 0, 1)
b. (0, 0, 1)
c. (1, 1, 1)
d. (0, 1, 1)

103. The output of a two level AND-OR gate network is F What is the output when all the gates are replaced by NOR gates? (where F_D is the dual function of F)

a. F
b. $\bar{F}$
c. F^D
d. $\bar{F}^D$

104. Which one of the following statements is correct?

a. PROM contains a programmable 'AND' array and a fixed 'OR' array
b. PLA contains a fixed 'AND' array and a programmable 'OR' array
c. PROM contains a fixed 'AND' array and a programmable 'OR' array
d. PLA contains a. programmable 'AND' array and a programmable 'NOR'. array

105. Which one of the following statements describes the operation of a multiplexer?

a. A logic circuit used to generate coded output
b. A logic circuit used to generate F's complement
c. A logic circuit accepts two or more inputs and allows one of them at a time to get through the output

d. A logic circuit that transmits one input to several output lines

106. A ROM is to be used to implement a "squarer", which outputs the square of a 4-bit number. What must be the size of the ROM?
   a. 16 address lines and 16 data. lines
   b. 4 address lines and 8 data lines
   c. 8 address lines and 8 data lines
   d. 4 address lines and 16 data lines
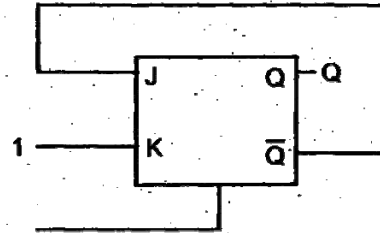
107. Consider the following circuit.
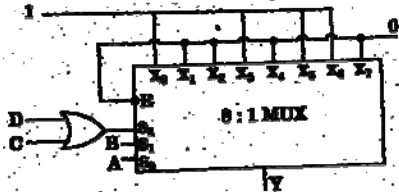
In the above TTL circuit, S_2 to S_0 are select lines and X_7 to X_0 are input lines. S_0 and X_0 are LSBs. What is the output Y?
   a. Indeterminable
   b. $A \oplus B$
   c. $\overline{A \oplus B}$
   d. $\overline{C \oplus B \oplus A}$

108. Which one of the following statements is not correct?
   a. An 8 input MUX can be used to implement any 4 variable function
   b. A 3 line to 8 line DEMUX can be used to implement any 4 variable function
   c. A 64 input MUX can be built using nine 8 input MUXs
   d. A 6 line to 64 line DEMUX can be bult using nine 3 line to 8 line DEMUXs

109. Consider the following statements:
For a master-slave J-K flip-flop,
   1. the toggle frequency is the maximum clock frequency at which the flip-flop will toggle reliably
   2. the data input must precede the clock triggering edge transition time by some minimum time
   3. the data input must remain fixed for a given time after the clock triggering edge transition time for reliable operation
   4. propagation delay time is equal to the rise time and fall time of the data
Which of the statements given above are correct?
   a. 1, 2 and 3
   b. 1, 2 and 4
   c. 1, 3 and 4
   d. 2 3 and 4

110. The total number of 1's in a 15-bit shift register is to be counted by clocking into a counter which is preset to 0. The counter must have which one of the following?
   a. 4bits
   b. S-bits
   c. 16-bits
   d. 6-bits

111. Consider the following J-K flip-flop:

In the above J-K flip-flop, $J = Q$ and K=1. Assume that the flip-flop was initially cleared and then clocked for 6 pulses. What is the sequence at the Q output?
   a. 010000
   b. 011001
   c. 010010
   d. 010101

112. Consider, the following statements regarding registers and latches
   1. Registers are made .of edge-triggered FFS, whereas latches are made from level-triggered FFS
   2. Registers are temporary storage devices whereas latches are not
   3. A latch employs cross-coupled feedback connections
   4. A register stores a binary word whereas a latch does not
Which of the statements given above are correct?
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 3 and 4

113. Consider the following shift rights register
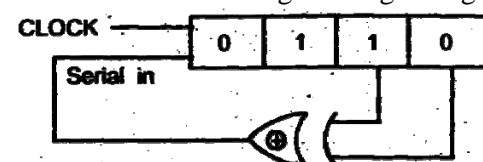
The initial contents of the 4-bit serial-in parallel-out, shift right register shown above are 0110. What will be the contents

of the register after 3 clock pulses are required?
a. 0000
b. 0101
c. 1010
d. 1111

114. Match list I (type of N-bit ADC) with List II (Characteristics) and select the correct answer:
List I
A. Flash converter
B. Successive approximation
C. Counter ramp
D. Dual slope
List II
1. Integrating type
2. Fastest converter
3. Maximum conversion time = N bits
4. Uses a DAC in its feedback path
Codes;

	A	B	C	D
a.	1	4	3	2
b.	1	3	4	2
c.	2	4	3	1
d.	2	3	4	1

115. What is the unit step response of unity feedback control system having forward path transfer function
$$G(s) = \frac{80}{s(s+18)}?$$
a. Over damped
b. Critically damped
c. Under damped
d. Undamped oscillatory

116. Consider the following statements for a.c. series motors:
1. The rotor is designed so that its RIX ratio is small
2. dT/dω < 0 where T and ω are torque and speed respectively
3. The reference and control voltages should be in phase quadrature, but their magnitudes need not be equal
Which of the statements given above are correct?
a. 1, 2 and 3
b. 1 and 2
c. 2 and 3
d. 1 and, 3

117. An open loop system has a transfer function

$\frac{1}{s^3 + 1.5s^2 + s - 1}$. It is converted into a closed loop system by providing a negative feedback having transfer function 20 (s + 1). Which one of the following is correct?
The open loop and closed loop systems are, respectively
a. stable and stable
b. stable and unstable
c. unstable and stable
d. unstable and unstable

118. A tachometer feedback is used as an inner loop in a position control servo-system. What is the effect of feedback on the gain of the sub-loop incorporating tachometer and on the effective time constant of the system?
a. Both are reduced
b. Gain is reduced but the time constant is increased
c. Gain is increased but the time constant is reduced
d. Both are increased

119. Consider the following statements
Feedback in control system can be used
1. to reduce the sensitivity of the system to parameter variations and disturbances
2. to change time constant of the system
3. to increase loop gain of the system
Which of the statements given above are correct?
a. 1, 2 and 3
b. 1 and 2
c. 2 and 3
d. 1 and 3

120. Which one of the following statements is correct in respect of the theory of stability?
a. Phase margin is the phase angle lagging, in short of 1800, at the frequency corresponding to a gain of 10
b. Gain margin is the value by which the gain falls short of unity, at a frequency corresponding to 90° phase lag
c. Routh-Hurwitz criterion can determine the degree of stability
d. Gain margin and phase margin are the measure of the degree of stability