

ELECTRONICS & TELECOMMUNICATION ENGINEERING

PAPER-II

1. A source deliver symbols X_1, X_2, X_3 and X_4 with probabilities $1/2, 1/4, 1/8$ and $1/8$ respectively. The entropy of the system is
 - a. 1.75 bits per second
 - b. 1.75 bits per symbol
 - c. 1.75 symbols per second
 - d. 1.75 symbols per bit
2. A system has a receiver noise resistance of 50Ω . It is connected to an antenna with an input resistance of 50Ω . The noise figure of the system is
 - a. 1
 - b. 2
 - c. 50
 - d. 101
3. A 10 kW carrier is sinusoidally modulated by two carriers corresponding to a modulation index of 30% and 40% respectively. The total radiated power is
 - a. 11.25 kW
 - b. 12.5 kW
 - c. 15 kW
 - d. 17 kW
4. In phase modulation, the frequency deviation is
 - a. independent of the modulating signal frequency
 - b. inversely proportional to the modulating signal frequency
 - c. directly proportional to the modulating signal frequency
 - d. inversely proportional to the square root of the modulating frequency
5. An arbitrary signal $m(t)$ has zero average value and it is band-limited to 3.2 kHz. It is sampled at the rate of 8 k samples/s. The samples are passed through an ideal band-pass filter with centre frequency of 32 kHz and bandwidth of 6.4 kHz. The output of the band-pass filter is
 - a. AM-DSB signal with suppressed carrier
 - b. AM-DSB signal with carrier
 - c. AM-SSB signal with carrier
 - d. a sequence of exponentially devaying sine waves
6. The correct sequence of subsystems in an FM receiver is
 - a. mixer, RF amplifier, limiter, IF amplifier, discriminator, audio amplifier
 - b. RF amplifier, mixer, IF amplifier, limiter, discriminator, audio amplifier
 - c. RF amplifier, mixer, limiter, discriminator, IF amplifier, audio amplifier
 - d. mixer, IF amplifier, limiter, audio amplifier, discriminator
7. 13 dBm is equivalent to
 - a. 2mW
 - b. 20W
 - c. 20mW
 - d. 2MW
8. Consider the following statements comparing delta modulation with PCM systems: DM requires
 1. a lower sampling rate
 2. a higher sampling rate
 3. a large bandwidth
 4. simpler hardware
 Which of these statements are correct?
 - a. 1, 2 and 4
 - b. 1, 2 and 3
 - c. 2, 3 and 4
 - d. 1, 3 and 4
9. 12 signals each band-limited to 5kHz are to be transmitted over a single channel by frequency division multiplexing. If AM-SSB modulation guard band of 1 kHz is

- used, then the bandwidth of the multiplexed signal will be
- 51 kHz
 - 61 kHz
 - 71 kHz
 - 81 kHz
10. A quarter-wave transformer is used for matching a load of 225 ohms connected to a transmission line of 256 ohms in order to reduce the SWR along the line to 1. The characteristic impedance (in ohms) of the transformer is
- 225
 - 240
 - 256
 - 273
11. For distortion less transmission through a channel, the channel should be such that
- its attenuation response is an even function and phase response is an odd function of frequency
 - its attenuation response is flat and phase response is linear with frequency
 - the ratio of line inductance to line capacitance is constant
 - its termination is by a matched impedance
12. In a super heterodyne receiver, the IF is 455 kHz, if it is tuned to 1200 kHz, the image frequency will be
- 1655 kHz
 - 75 kHz
 - 2110 kHz
 - 910 kHz
13. Ghost in a television picture is due to
- poor frequency response of the video amplifier
 - multipath reception of signals
 - incorrect tuning
 - the poor phase characteristics of the IF amplifier
14. In a radar system, if the peak transmitted power is increased by a factor of 16 and the antenna diameter is increased by a factor of 2, then the maximum range will increase by a factor of
- 16
 - 8
 - 4
 - $\sqrt{8}$
15. A glass fibre has refractive indices n_1 of 1.5 and n_2 of 1. Assuming $c = 3 \times 10^8$ m/s the multipath time dispersion will be
- 2.5 ns/m
 - 2.5 μ s/m
 - 5 ns/m
 - 5 μ s/m.
16. The electric field at a point from a transmitter radiating a certain power is 2.5 mV/m. If the transmitter power is doubled, the field strength at that point will be about
- 2.5 mV/m
 - 3.5 mV/m
 - 5 mV/m
 - 10 mV/m
17. When VSWR is 3, the magnitude of the reflection coefficient will be
- 1/4
 - 1/3
 - 1/2
 - \$1
18. If 0, 1, 2, \$, £ are the r digits in ascending order in a number system with radix r , then £ multiplied by £ will be
- £ 1
 - 1 £
 - 1 \$
 - \$ 1
19. The expression for the infix equivalent of the prefix form of $+ - * \uparrow ABCD/E/F + GH$ will be
- $A^{B.C} * D - E / F / G + H$
 - $A^B * C - D + E / F / G + H$
 - $A^B * C - D + E / F / (G + H)$
 - $A^B * C - D + E / F / (G + H))$
20. A PASCAL function is defined as
- ```

Salc (var A : real; B : real) : real; begin
X := 3.0; Y := 3.0;
Calc := 5.0 * A + (B - A); end;
It this function was called

```

X: = 7.0;                      Y: = 1.0;

R := calc (X, Y);

the value of R would be

- 15
- 29
- 13
- 31

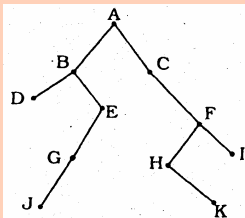
21. Consider the following statements:

1. An assembly language program runs faster than a high level language program to produce the desired result.
2. An assembler which runs on a computer for which it produces object codes is called a resident assembler.
3. A cross-assembler is an assembler that runs on a computer than that for which it provides machine codes.
4. A one-pass assembler reads the assembly language programs only once.

Which of these statements are correct?

- 1, 2 and 3
- 2, 3 and 4
- 1 and 4
- 1, 2, 3 and 4

22. if the given binary tree is traversed in post-order



Then the order of nodes visited is

- J G E D B K H I F C A
- D B J G E A K H F I C
- D J G E B K H I F C A
- A B D E G J C F H K I

23. The principle of locality of reference justifies the use of

- Interrupts
- DMA
- Virtual memory
- Cache memory

24. Consider the following features:

1. Negative operands cannot be used.
2. When immediate operand changes, the program should be reassembled.
3. The program is difficult to read.
4. The size of operand is restricted by word length of the computer.

Disadvantages of immediate addressing include

- 1 and 2
- 2 and 4
- 2 and 3
- 1 and 4

25. The method used to transfer data from I/O units to memory by suspending the memory – CPU data transfer for one memory cycle is called

- I/O spooling
- cycle stealing
- line conditioning
- demand paging

26. The characteristic equation of an SR flip-flop is given by

- $Q_{n+1} = S + RQ_n$
- $Q_{n+1} = RQ_n + SQ_n$
- $Q_{n+1} = S + RQ_n$
- $Q_{n+1} = S + RQ_n$

27. A 6 MHz channel is used by digital signaling system utilizing four-level signals. The maximum possible transmission rate is

- 6 M bauds/s
- 12 M bauds/s
- 6 M bauds/s
- 12 M bauds/s

28. The access time of a word in 4 MB main memory is 100 ns. The access time of a word in a 32kB data cache memory is 10 ns. The average data cache hit ratio is 0.95. The effective memory access time is

- 9.5 ns
- 14.5 ns
- 20 ns
- 95 ns

29. In 8086 microprocessor, if the code segment register contains 1 FAB and IP

register contains 10 AI, the effective memory address is

- a. 20 B 51
- b. 304 C
- c. FBC 0
- d. F D B 5

30. To have the multiprocessing capabilities of the 8086 microprocessor, the pin connected to the ground is

- a.  $\overline{DEN}$
- b. ALE
- c. INTR
- d.  $MN/\overline{MX}$

31. Assertion (A): A monostable multivibrator can be used to alter the pulse width of a repetitive pulse train

Reason (R): Monostable multivibrator has a single stable state of A

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

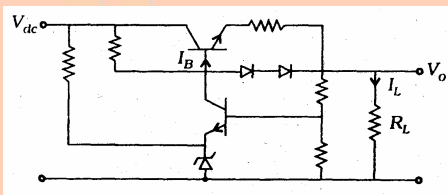
32. Assertion (A): Miller sweep circuit producing sawtooth waveform is a relaxation oscillator.

Reason (R): The active device alternately supplies power to the load and relaxes when it is cut off.

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

33. Assertion (A): In the circuit shown in the figure, above a prescribed value of load current  $I_L$ ,  $V_o$  will gradually fall.

Reason (R): Above the prescribed value, as load current  $I_L$  increases,  $I_B$  decreases.



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

34. Assertion (A): A large negative feedback is deliberately introduced in an amplifier to make its gain independent of the variation of parameters of the active device and other circuit components.

Reason (R): A large negative feedback results in a high value of return difference compared to unity, which makes the feedback gain inversely proportional to the feedback factor

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

35. Assertion (A): A demultiplexer can be used as a decoder.

Reason (R): A demultiplexer is built by using AND gates only.

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

36. Assertion (A): The output of an 8-bit A to D converter is 80H for an input of 2.5 V.

Reason (R): ADC has an output range of 00 to FFH for an input range of -5V to +5V.

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

37. Assertion (A): The phase angle plot in Bode diagram is not affected by the variation in the gain of the system.



Reason (R) The variation in the gain of the system has no effect on the phase margin of the system.

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

38. Assertion (A): In a small flare angle pyramidal horn excited by a  $TE_{10}$  rectangular waveguide, the operative field distribution is also very nearly that of TE mode.

Reason (R): In a small flare angle horn, the throat acts as a mode filter.

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

39. Assertion (A): MASER is a low noise micro wave source.

Reason (R): MASER operation is carried out at cryogenic temperatures.

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

40. Assertion (A): Fading in microwave transmission in inhomogeneous atmospheres is more severe at higher frequencies.

Reason (R): The effect of changes in path length of the microwave signal through the atmosphere increases with frequency.

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

41. Assertion (A): Square law detectors are not particularly satisfactory for the detection of modulated signals.

Reason (R): With square law detectors, harmonic distortion of as high as 25% occurs for a completely modulated signal.

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

42. Assertion (A): One of the functions of the radar beacon is to identify itself.

Reason (R): Radar beacon cannot operate over a large distance.

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

43. Assertion (A): Modern long-distance communication is carried out via satellite.

Reason (R): It covers the entire globe without appreciable fading of signals.

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

44. Assertion (A): The top down structured programming should be used for developing programs.

Reason (R): The top down structured programming methodology enables us to get readable and easily provable programs.

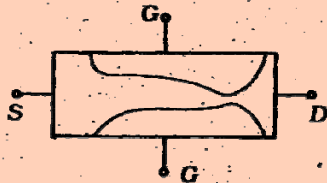
- a. Both A and R are true and R is the correct explanation of A.
- b. Both A and R are true but R is NOT the correct explanation of A
- c. A is true but R is false
- d. A is false but R is true

45. Assertion (A): The 'do-while' statements are used less frequently than the 'while' statement.

Reason (R): For most applications, it is more natural to test for continuation of a loop at the beginning rather than at the end of the loop.

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

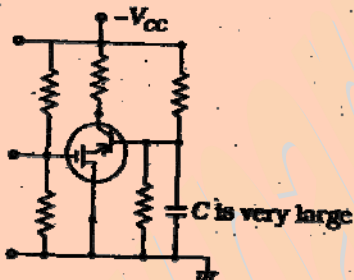
46. In a biased JFET the shape of the channel is as shown in the given figure



because

- a. it is the property of the material used
- b. the drain end is more reverse biased than source end
- c. the drain end is more forward biased than source end
- d. the impurity profile varies with the distance from source

47. The given figure shows a composite transistor consisting of a MOSFET and a bipolar transistor in cascode



The MOSFET has a trans-conductance  $g_m$  of 2 mA/V and the bipolar transistor has  $\beta(h_{fe})$  of 99. The overall Trans conductance of the composite transistor is

- a. 198 mA/V
- b. 19.8 mA/V
- c. 1.98 mA/V
- d. 1.98 mA/V

48. In a single-stage differential amplifier, the output offset voltage is basically dependent on the mismatch of

- a.  $V_{BE}$ ,  $I_B$  and  $\beta$
- b.  $V_{BE}$  and  $I_B$
- c.  $I_B$  and  $\beta$

d.  $V_{BE}$  and  $\beta$

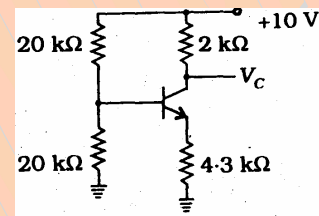
49. The input resistance of a common emitter stage can be increased by

- 1. unbypassing emitter resistance
- 2. bootstrapping
- 3. biasing it at low quiescent current
- 4. using compounded BJTs

The correct sequence in descending order of the effectiveness of these methods is

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

50. The collector voltage  $V_C$  of the circuit shown in the given figure



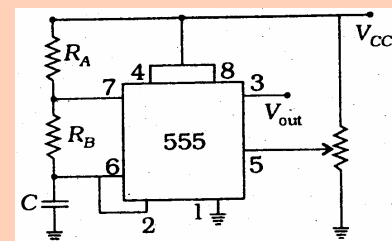
Is approximately

- a. 2 V
- b. 4.6 V
- c. 8 V
- d. 8.6 V

51. Thermal runaway will take place if the quiescent point is such that

- a.  $V_{CE} > \frac{1}{2} V_{CC}$
- b.  $V_{CE} < V_{CC}$
- c.  $V_{CE} < 2V_{CC}$
- d.  $V_{CE} < \frac{1}{2} V_{CC}$

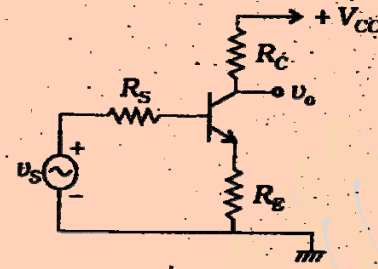
52. Circuit shown in the given figure



represents

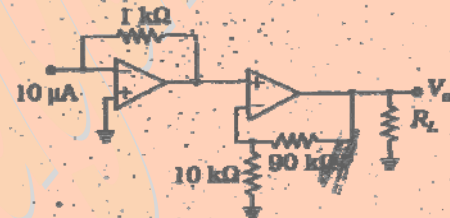
- a. an astable multivibrator
- b. a monostable multivibrator

- c. voltage-controlled oscillator  
d. ramp generator
53. In a feedback series regulator circuit, the output voltage is regulated by controlling the
- magnitude of the input voltage
  - gain of the feedback transistor
  - reference voltage
  - voltage drop across the series pass transistor
54. A three-terminal monolithic IC regulator can be used as
- an adjustable output voltage regulator alone
  - an adjustable output voltage regulator and a current regulator
  - a current regulator and a power switch
  - a current regulator alone
55. Which one of the following devices is NOT used as the controller in a stabilizer?
- Diac
  - Triac
  - SCR
  - Power transistor
56. A second-order band-pass active filter can be obtained by cascading a low-pass second-order section having cut-off frequency  $f_{OH}$  with a high-pass second-order section having cut-off frequency  $f_{OL}$  provided
- $f_{OH} > f_{OL}$
  - $f_{OH} < f_{OL}$
  - $f_{OH} = f_{OL}$
  - $f_{OH} \leq \frac{1}{2} f_{OL}$
57. If a class C power amplifier has an input signal with frequency of 200 kHz and the width of collector current pulses of 0.1  $\mu$ s, then the duty cycle of the amplifier will be.
- 1%
  - 2%
  - 10%
  - 20%
58. The given circuit has a feedback factor of



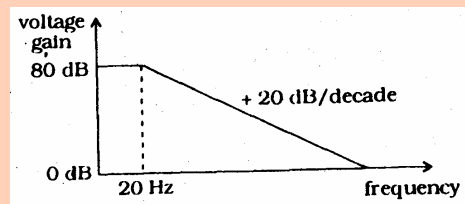
- $-R_C / R_S$
- $-R_E / R_C$
- $-R_E / R_C$
- $-R_C / R_E$

59. A Hartley oscillator is used for generating
- very low frequency oscillation
  - radio—frequency oscillation
  - microwave oscillation
  - audio—frequency oscillation
60. The output voltage  $V_O$  of the given circuit



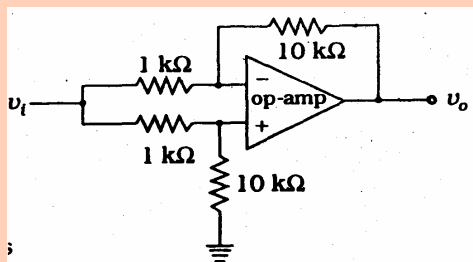
- is
- 100 V
  - 100 mV
  - 10 V
  - 10 mV

61. The voltage gain versus frequency curve of an Op-Amp is shown in the given figure



The gain-bandwidth product of the Op-Amp is

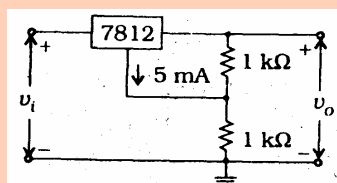
- 200 Hz
  - 200 MHz
  - 200 kHz
  - 2 MHz
62. The  $v_O$  of the Op-Amp circuit shown in the given figure



is

- a.  $11v_i$
- b.  $10v_i$
- c.  $v_i$
- d. zero

63. A 12 V monolithic regulator is adjusted to obtain a higher output voltage as shown in the given figure

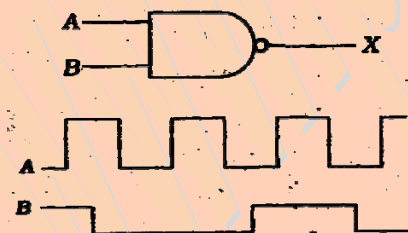


The  $v_o$  will be

- a. 12 V
- b. 17 V
- c. 24 V
- d. 29 V

64. The voltage levels of a negative logic system
- a. must necessarily, be negative
  - b. may be negative or positive
  - c. must necessarily be positive
  - d. must necessarily be 0V and -5V

65. The given figure shows a NAND gate with input wave forms A and B



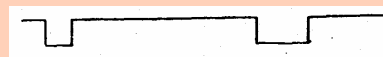
The correct output waveform X of the gate is

a.



b.

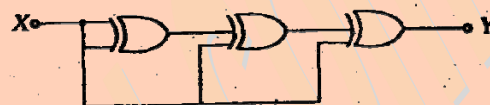
c.



d.



66. The output Y of the given circuit



is

- a. 1
- b. zero
- c. X
- d.  $\bar{X}$

67. The Boolean theorem

$AB + \bar{A}C + AB = AB + AC$  corresponds to

- a.  $(A + B).(\bar{A} + C).(B + C) = (A + B).(\bar{A} + C)$
- b.  $AB + \bar{A}C + BC = AB + BC$
- c.  $AB + \bar{A}C + BC(A + B).(\bar{A} + C).(B + C)$
- d.  $(A + B).(\bar{A} + C).(B + C) = AB + \bar{A}C$

68. Match List I (Circuits) with List II (Types of integration level) and select the correct answer:

List I

- A. Full adder.
- B. Magnitude comparator
- C. Programmable logic array

List II

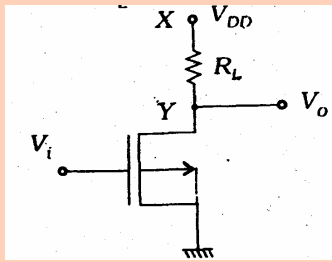
- 1. VLSI
- 2. SSI
- 3. MSI

Codes;

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

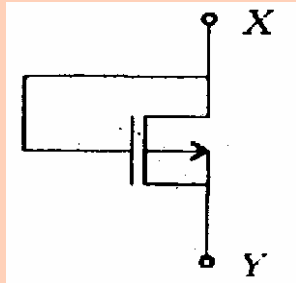
69. The load resistance  $R_L$  between X and Y in the switch shown in Figure - I



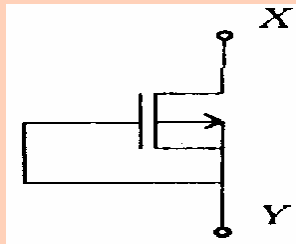


CANNOT be replaced by

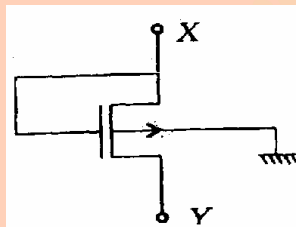
a.



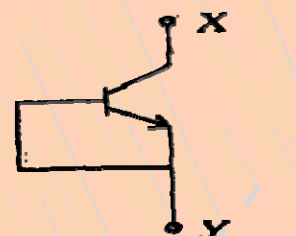
b.



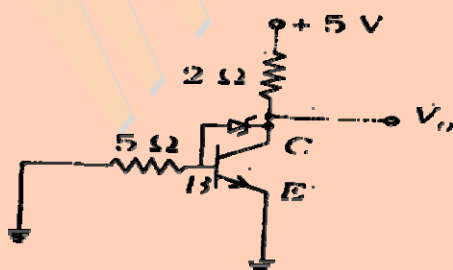
c.



d.



70. The voltage  $V_o$  of the circuit shown in the given figure



is

- a. 5 V
- b. 3.1 V
- c. 2.5 V
- d. zero

71.  $Y = f(A, b) = \prod M(0, 1, 2, 3)$  represents (M is maxterm)

- a. NOR gate
- b. NAND gate
- c. OR gate
- d. A situation where output is independent of input

72. Consider the following statements regarding ICs:

- 1. ECL has the least propagation delay.
- 2. TTL has the largest fanout.
- 3. CMOS has the biggest noise margin.
- 4. TTL has the lowest power consumption.

Which of these statements are correct?

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

73. For a logic family

$V_{OH}$  is the minimum output high level voltage

$V_{OL}$  is the maximum output low level voltage

$V_{IH}$  is the minimum acceptable input high level voltage

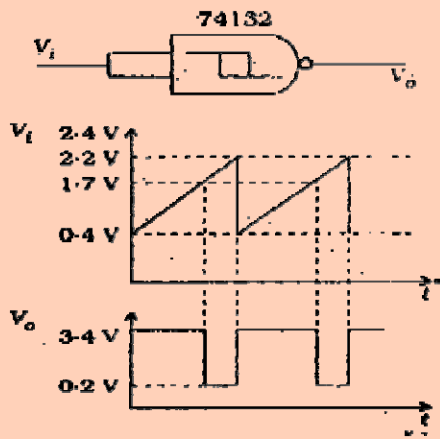
$V_{IL}$  is the maximum acceptable input low level voltage

The correct relationship among these is

- a.  $V_{IH} > V_{OH} > V_{IL} > V_{OL}$
- b.  $V_{OH} > V_{IH} > V_{IL} > V_{OL}$
- c.  $V_{IH} > V_{OH} > V_{OL} > V_{IL}$
- d.  $V_{OH} > V_{IH} > V_{OL} > V_{IL}$

74. The input waveform  $V_i$  and the output waveform  $V_o$  of a Schmitt NAND are shown in the given figures

The duty cycle of the output waveform will be



- 100%
- 85.5%
- 72.2%
- 25%

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

List I (pre terminals)

- SID, SOD
- READY
- TRAP
- ALE

List II (Applications)

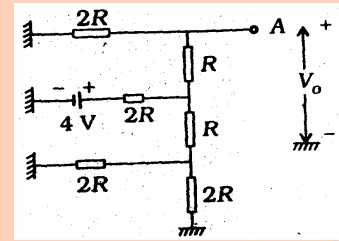
- Wait state
- Interrupt
- Serial data transfer
- Memory of I/O read / write
- Address latch control

Codes;

|    | A | B | C | D |
|----|---|---|---|---|
| a. | 3 | 1 | 5 | 2 |
| b. | 3 | 1 | 2 | 5 |
| c. | 4 | 3 | 2 | 5 |
| d. | 4 | 3 | 1 | 2 |

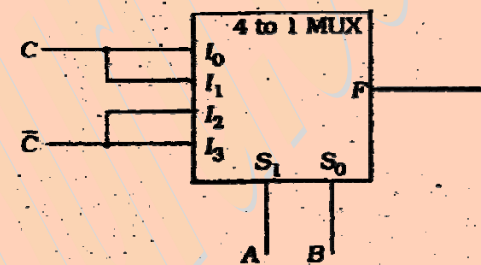
76. The software that transfers the object program from secondary memory to the main memory is called
- Assembler
  - Loader
  - Linker
  - Task builder

77. The output voltage  $V_o$  with respect to ground of the R-2R ladder network shown in the given figure



- 1 V
- 2 V
- 3 V
- 4 V

78. The logic circuit realized by the circuit shown in the given figure



will be

- $F = B \odot C$
- $F = B \oplus C$
- $F = A \odot C$
- $F = A \oplus C$

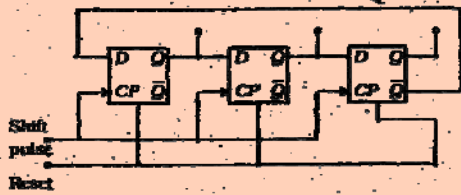
79. In a negative edge triggered J-K flip-flop, in order to have the output Q state 0, 0 and 1 in the next three successive clock pulses, the J - K input states required would be respectively

- 00, 01 and 10
- 00, 01 and 11
- 00, 10 and 01
- 01, 10 and 11

80. The initial state of MOD-16 down counter is 0110. After 37 clock pulses, the state of the counter will be

- 1011
- 0110
- 0101
- 0001

81. A three-bit shift register is shown in the given figure



To have the content '000' again, the number of clock pulses required would be

- 3
  - 6
  - 8
  - 16
82. Symmetrical square wave of time period 100  $\mu$ s can be obtained from square wave of time period 10  $\mu$ s by using a
- divide by-5 circuit
  - divide by-2 circuit
  - divide by-5 circuit followed by a divide by-2 circuit
  - BCD counter
83. A 1  $\mu$ s pulse can be converted into a 1 ms pulse by using
- a monostable multivibrator
  - an astable multivibrator
  - a bistable multivibrator
  - a J-K flip-flop
84. For a particular type of memory, the access time and the cycle time are respectively 200 ns and 200 ns. The maximum rate at which the data can be accessed, is
- $2.5 \times 10^6/s$
  - $5 \times 10^6/s$
  - $0.2 \times 10^6/s$
  - $10^6/s$
85. When a human being tries to approach an object, his brain acts as
- an error measuring device \_\_\_\_\_
  - a controller
  - an actuator
  - an amplifier
86. Consider the loop transfer function

$$G(s)H(s) = \frac{K(s+6)}{(s+3)(s+5)}$$

In the root-locus diagram, the centroid will be located at

- 4
- 1
- 2
- 3

87. Consider the following statements:

In root-locus plot, the breakaway points

- need not always be on the real axis alone
- must lie on the root loci
- must lie between 0 and -1

Which of these statements are correct?

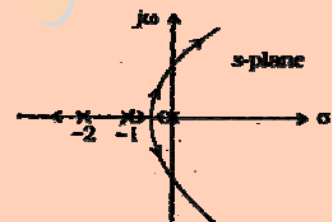
- 1, 2 and 3
- 1 and 2
- 1 and 3
- 2 and 3

88. For a unity negative feedback control system) the open- loop transfer function is

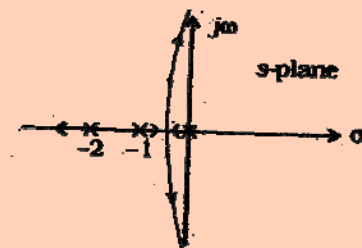
$$G(s) = \frac{K}{s(s+1)(s+2)}$$

The root-locus plot of the system is

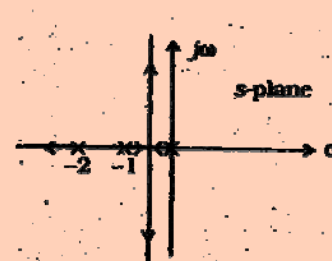
a.



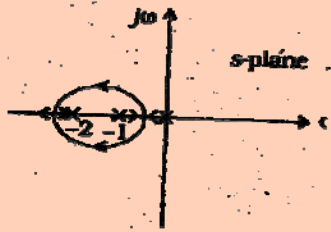
b.



c.



d.



89. For t-phase a.c. servomotor, if the rotor's resistance and reactance are respectively R and X, its length and diameter are respectively L and D, then

a. X/R and L/D are both small  
 b. X/R is large but L/D is small  
 c. X/R is small but L/D is large  
 d. X/R and L/D are both large

90. Consider the following statements relating to synchros:

1. The rotor of the control transformer is either disc shaped or umbrella shaped.  
 2. The rotor of the transmitter is so constructed as to have a low magnetic reluctance.  
 3. Transmitter and control transformer pair is used as an error detector.

Which of these statements are correct?

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

91. First column elements of the Routh's tabulation are 3, 5, -3/4, 1/2, 2. It means that there

a. is one root in the left half of s-plane  
 b. are two roots in the left half of s-plane  
 c. are two roots in the right half of s-plane  
 d. is one root in the right half of s-plane

92. The response  $c(t)$  of a system is described by the differential equation

$$\frac{d^2 c(t)}{dt^2} + 4 \frac{dc(t)}{dt} + 5c(t) = 0$$

The system response is

a. undamped  
 b. underdamped  
 c. critically damped

d. oscillatory

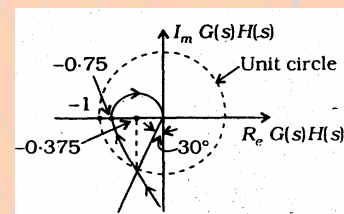
93. The radius of constant-N circle for  $N = 1$  is

a. 2  
 b.  $\sqrt{2}$   
 c. 1  
 d.  $1/\sqrt{2}$

94. The constant-M circle for  $M = 1$  is the

a. straight line;  $x = -1/2$   
 b. critical point  $(-1, j0)$   
 c. circle with  $r = 0.33$   
 d. circle with  $r = 0.67$

95. A portion of the polar plot of an open-loop transfer function is shown in the given figure



The phase margin and gain margin will be respectively

a.  $30^\circ$  and 0.75  
 b.  $60^\circ$  and 0.375  
 c.  $60^\circ$  and 0.75  
 d.  $60^\circ$  and  $1/0.75$

96. The polar plot of a transfer function passes through the critical point  $(-1, 0)$ . The gain margin is

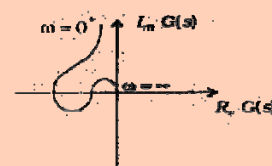
a. zero  
 b. -1 dB  
 c. 1 dB  
 d. infinity

97. The open-loop transfer function of a unity negative feedback system is

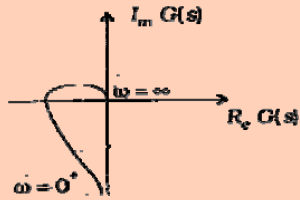
$$G(s) = \frac{K(s+10)(s+20)}{s^2(s+100)(s+200)}$$

The polar plot of the system will be

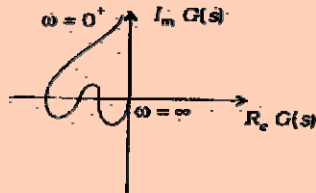
a.



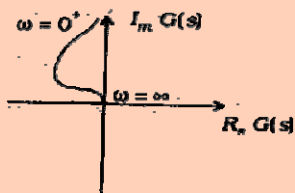
b.



c.



d.



98. If the transfer function of a phase lead compensator is  $\frac{s+a}{s+b}$  and that of a lag compensator is  $\frac{s+p}{s+q}$ , then which one of the following sets of conditions must be satisfied?

- $a > b$  and  $p > q$
- $a > b$  and  $p < q$
- $a < b$  and  $p < q$
- $a < b$  and  $p > q$

99. The compensator

$$G_c(s) = \frac{5(1+0.3s)}{1+0.1s}$$

Would provide a maximum phase shift of

- $20^\circ$
- $45^\circ$
- $30^\circ$
- $60^\circ$

100. The system with the open-loop transfer function  $G(s)H(s) = \frac{1}{s(1+s)}$  is

- type 2 and order 1
- type 1 and order 1
- type 0 and order 0
- type 1 and order 2

101. The transfer function  $G(s)$  of a PID controller is

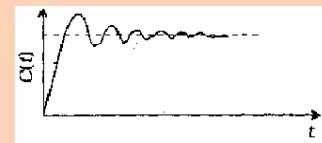
- $K \left[ 1 + \frac{1}{T_i s} + T_d s \right]$
- $K [1 + T_i s + T_d s]$
- $K \left[ 1 + \frac{1}{T_i s} + \frac{1}{T_d s} \right]$
- $K \left[ 1 + T_i s + \frac{1}{T_d s} \right]$

102. The industrial controller having the best steady-state accuracy is

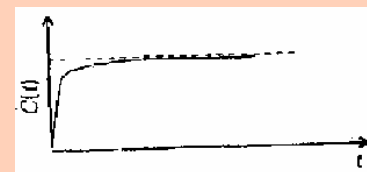
- a derivative controller.
- an integral controller
- a rate feedback controller
- a proportional controller

103. A step input is applied to a system with the transfer function  $G(s) = \frac{e^{-s}}{1+0.5s}$ . The output response will be

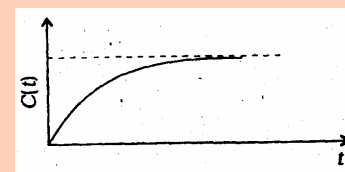
a.



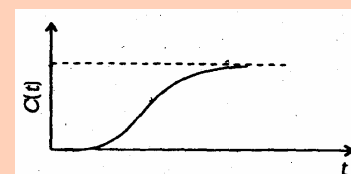
b.



c.



d.



104. A coaxial RF cable has the characteristic impedance of  $50\Omega$  and a nominal capacitance of  $40 \text{ pF/m}$ . The inductance of the cable is

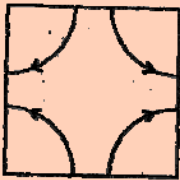


- a.  $1 \mu \text{ H/m}$
- b.  $10 \mu \text{ H/m}$
- c.  $0.1 \mu \text{ H/m}$
- d.  $0.01 \mu \text{ H/m}$

105. HEMT used in the microwave circuit is a

- a. source
- b. high power amplifier
- c. low noise amplifier
- d. detector

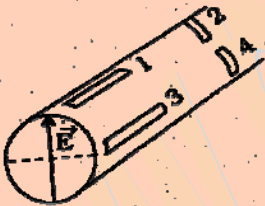
106. Given figure shows the electrical field pattern of  $\text{TE}_{11}$  mode in a square waveguide



If the waveguide cross-section is gradually deformed into a circle, the circular waveguide mode will be

- a.  $\text{TE}_{11}$
- b.  $\text{TE}_{01}$
- c.  $\text{TE}_{21}$
- d.  $\text{TE}_{12}$

107. In the circular waveguide, the slots labelled 1, 2, 3 and 4 carry  $\text{TE}_{11}$  mode as shown in the given figure



Which one of the following is the correct set of radiating and non-radiating slots respectively?

- a. (1, 3) and (2, 4)
- b. (2, 3) and (1, 4)
- c. (2, 4) and (1, 3)
- d. (1, 4) and (2, 3)

108. On terminating a waveguide. If a one-port cavity resonator produces a reflection coefficient. of  $0.5 \angle 0^\circ$ , the coupling characteristics (over/under/critically) and coupling coefficients will be respectively

- a. Over coupled and 2

- b. Under coupled and 0.5
- c. Over coupled and 3
- d. critically coupled and 1

109. For an aperture antenna of aperture dimension  $D$  and wavelength of radiation from the antenna, the far-field is at a distance greater than

- a.  $D^2/2\lambda$
- b.  $2D^2/\lambda$
- c.  $D^2/\lambda$
- d.  $(2D)^2/\lambda$

110. Consider the following statements about advantages and disadvantages of offset parabolic reflector antenna:

1. It reduces aperture blocking but degrades side lobe level.
2. It can be used as a multibeam or dual polarized antenna.
3. A linearly polarized illumination causes no cross-polarized component in the radiation pattern.
4. It improves isolation between reflector and primary feed.

Which of these statements are correct?

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

111. Consider the following components in a two-port transmission loss measurement setup

1. Sweet oscillator
2. Variable attenuator
3. Device under test (DUT)
4. Power meter

The correct sequence of connection of these components is

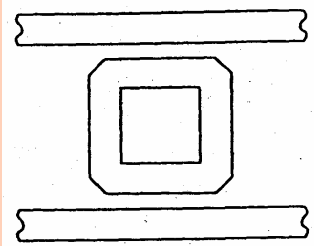
- a. 1,2,3,4
- b. 1,2,4,3
- c. 2,1,3,4
- d. 2,1,4,3

112. On a microstrip line, the wavelength measure is 12 mm for a 10 GHz signal. The dielectric constant of the equivalent homogeneous line is

- a. 3.5

- b. 5.5
- c. 6.25
- d. 7

113. The microstrip conductor pattern shown in the given figure



is that of

- a. a loss-pass filter
  - b. a high-pass filter
  - c. a channel dropping filter
  - d. an evanescent mode filter
114. In microwave communication links, the rain-drop attenuation experienced is mainly due to
- a. absorption of microwave energy by water vapour
  - b. resonance absorption of atomic vibration in water molecules
  - c. scattering of microwaves by collection of water-drops
  - d. refraction of microwaves through liquid-drops lenses formed by rain
115. A 1000 V source and detector sensitivity of 1 mV are connected to a long-haul transmission link of attenuation of 1 dB per 100 m. The maximum link length is
- a. 10 km
  - b. 12 km
  - c. 15 km
  - d. 20 km

116. Consider the following statements:

Ferrite is

- 1. a non-conductor with magnetic properties
- 2. an insulator with non-magnetic properties
- 3. a microwave semi-conductor invented by Faraday
- 4. an insulator with gyro-magnetic properties

Which of these statements are correct?

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

117. A plane wave of 10 GHz is incident normally on a dielectric plate of 3 mm thickness. If the phase shift on transmission through the-sheet is  $90^\circ$ , then the dielectric constant is

- a. 2.5
- b. 3.25
- c. 4.5
- d. 6.25

118. Consider the following statements:

He-Ne laser

- 1. gives continuous output
- 2. emits red light
- 3. required a d.c. magnet
- 4. can be voice modulated by using a Kerr cell

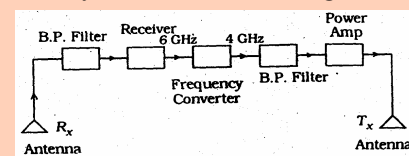
Which of these statements are correct?

- a. 1, 2 and 3
- b. 1, 3 and 4
- c. 1, 2 and 4
- d. 2, 3 and 4

119. In an LOS communication system, the ground below the direct path is the first Fresnel zone and is smooth reflecting. The phase difference between the direct and reflected waves at the receiving antenna will be

- a.  $180^\circ$
- b.  $360^\circ$
- c.  $270^\circ$
- d.  $450^\circ$

120. The system shown in the given figure



is

- a. an LOS link
- b. a satellite transponder
- c. a low noise amplifier
- d. a frequency divider