# ELECTRONICS & TELECOMMUNICATION ENGINEERING

## PAPER-II

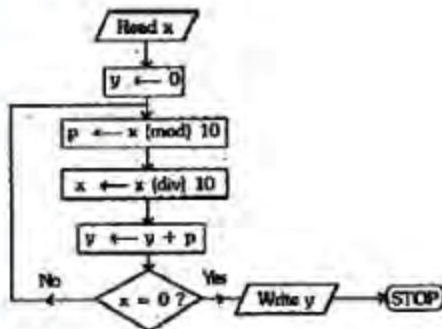1. A telephone channel has bandwidth B of 3 kHz and SNR (S / ηB) of 30 dB. It is connected to a teletype machine having 32 different symbols. The symbol rate required for errorless transmission is nearly
   a. 1800 symbols/s
   b. 3000 symbols/s
   c. 5000 symbols/s
   d. 6000 symbols/s

2. Quadrature multiplexing is
   a. same as FDM
   b. same as TDM
   c. a combination of FDM and TDM
   d. the scheme where same carrier frequency is used for two different signals

3. The ramp signal m(t) = at is applied to a delta modulator with sampling period $T_s$ and step size δ. Slope overload distortion would occur if
   a. $δ < a$
   b. $δ > a$
   c. $δ < aT_s$
   d. $δ > aT_s$

4. Which one of the following statements regarding the threshold effect in demodulators is correct?
   a. It is exhibited by all demodulators when the input signal to noise ratio is low
   b. It is the rapid fall in output signal to noise ratio when the input signal to noise ratio falls below a particular value
   c. It is the property exhibited by all AM suppressed carrier coherent demodulators
   d. It is the property exhibited by correlation receivers

5. In a PCM system each quantisation level is encoded into 8 bits. The signal to quantisation noise ratio is equal to
   a. $\frac{1}{12}\left(\frac{1}{256}\right)^2$

   b. 48 dB
   c. 64 dB
   d. 256 dB

6. A band-pass signal has significant frequency components in the range of 1.5 MHz to 2 MHz. If the signal is to be reconstructed from its samples, the minimum sampling frequency will be
   a. 1 MHz
   b. 2 MHz
   c. 3.5 MHz
   d. 4 MHz

7. In a single error correcting Hamming code, the number of message bits in a block is 26. The number of check bits in the block would be
   a. 3
   b. 4
   c. 5
   d. 7

8. If binary PSK modulation is used for transmission, the required minimum bandwidth is 9600 Hz. To reduce the transmission bandwidth to 2400 Hz, the modulation scheme to be adopted should be
   a. quadrature phase - shift keying
   b. minimum shift keying
   c. 16-ary quadrature amplitude modulation
   d. 8-ary PSK

9. Match List I (Operations) with List II (Functions) and select the correct answer :
   List I
   A. Companding
   B. Squelch
   C. Preemphasis
   D. Double conversion
   List II
   1. Improving image rejection
   2. Variation of step rise in quantisation
   3. Muting the receiver
   4. Boosting of higher modulating frequencies at the transmitter

| | A | B | C | D |
|---|---|---|---|---|
| a. | 2 | 3 | 4 | 1 |

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

10. A signal $m(t) = 5 \cos 2\pi\ 100\ t$ frequency modulates a carrier. The resulting FM signal is
$10 \cos \{(2\pi\ 10^5\ t) + 15 \sin (2\pi\ 100\ t)$
The approximate bandwidth of the FM signal would be
   a. 0.1 kHz
   b. 1 kHz
   c. 3.2 kHz
   d. 100 kHz

11. Four signals each band-limited to 5 kHz are sampled at twice the Nyquist rate. The resulting PAM samples are transmitted over a single channel after time division multiplexing. The theoretical minimum transmission bandwidth of the channel should be equal to
   a. 5 kHz
   b. 20 kHz
   c. 40 kHz
   d. 80 kHz

12. In Troposcatter links, diversity system is made use of to
   a. increase the bandwidth
   b. increase the directivity of the antenna
   c. prevent noise effects
   d. detect signal in the presence of fading

13. If a sky wave with a frequency of 50 MHz is incident on the D-region at an angle of 30°, then the angle of refraction is
   a. 15°
   b. 60°
   c. 30°
   d. 5.5°

14. An altimeter is basically
   a. a CW radar
   b. a FM radar
   c. a Doppler radar
   d. a device to indicate the direction at height

15. Generally, a transversal type equaliser with 5 taps can take care of distorted signal due to intersymbol interference in the received signal at
   a. 4 sampling instants
   b. 5 sampling instants
   c. 9 sampling instants
   d. 10 sampling instants

16. Antenna elevation angle at the ground station for satellite communication is always kept above 5° to

a. minimize the sky noise temperature
b. reduce the effect of oxygen and water vapour absorption on the antenna noise temperature
c. minimize the slant range
d. increase the visibility of the satellite

17. Random satellite moves in
   a. random paths
   b. polar orbits
   c. geostationary orbits
   d. equatorial plane

18. Match List I with List II and select the correct answer:
List I
A. Ferrit circulator
B. E-plane Tee
C. Velocity modulation
D. Reflex klystron
List II
1. Adjustable transmission line stub
2. Transmit time effect
3. Pump oscillator for parametric amplifier
4. Microwave resonator

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

19. Match List I with List II and select the correct answer :
List I
A. AM Broadcast
B. FM Broadcast
C. TV Broadcast
D. Point-to-point communication
List II
1. Tropospheric waves
2. 535kHz-1600kHz
3. Repeater tower
4. VSB modulation
5. Multipath phenomenon

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

20. The minimum decimal equivalent of the number 11C.0 is
   a. 183
   b. 194
   c. 268
   d. 269

21. $(FE35)_{16}$ XOR $(CB15)_{16}$ is equal to

a. $(3320)_{16}$
b. $(FF35)_{16}$
c. $(FF50)_{16}$
d. $(3520)_{16}$

22.



If the value of x in decimal number is 3954, the value of y in decimal number computed by the given flow chart is
a. 20
b. 22
c. 21
d. 3954

23. In C language, f– =9 is equivalent to
a. f = –9
b. f = f – 9
c. f = 9 – 1
d. –f = 9

24. A primitive computer uses a single register. The following fragment of assembly code is written for the machine:

LOAD X
MULT Y
STORE T1
MULT T1
STORE T1
LOAD Z
ADD Z
ADD T1
STORE R

Which one of the following expressions is evaluated ?
a. $R := (XY) + Y + Z$
b. $R := (XY)^2 + Y + Z$
c. $R := (XY)^2 + Y + Z$
d. $R : XY^2 + (Y + Z)$

25. A single edge is added to a tree without increasing the number of nodes. The number of cycles in the resulting graph is equal to
a. zero
b. one
c. two
d. indeterminate

26. The prefix form of the expression X + Y – Z is
a. – + XYZ
b. + – XYZ
c. XYZ – +
d. XYZ + –

27. Consider the following statements :
The horizontal microinstruction has
1. longer control word than vertical microinstruction.
2. high degree of parallelism
3. slower execution than vertical microinstruction
Which of these statements is/are correct?
a. 1 alone
b. 2 alone
c. 1 and 2
d. 2 and 3

28. The logic operation that will selectively clear bits in register A in those positions where there are 1's in the bits of register B is given by
a. $A \leftarrow A + B$
b. $A \leftarrow \overline{AB}$
c. $A \leftarrow \overline{A} + \overline{B}$
d. $A \leftarrow A\overline{B}$

29. Which one of the following is loaded in the main memory by the bootstrap loader?
a. System data
b. User program
c. BIOS
d. Parts of DOS

30. If a RAM has 34 bits in its MAR and 16 bits in its MDR, then its capacity will be
a. 32 GB
b. 16 GB
c. 32 MB
d. 16 MB

31. In 8086, if the content of the code segment register is 1 FAB and the content of the IP register is 10A1, then the effective memory address is
a. 1FBC0
b. 304C
c. FDB5
d. 20B51
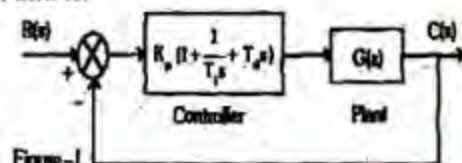
32. PID control for a plant is shown in Figures I and II.
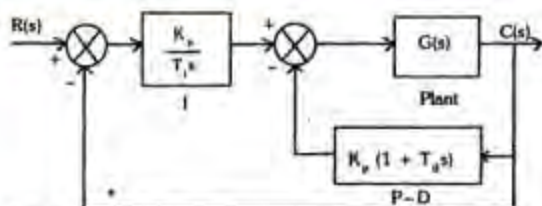


Figure–I

Figure – II

Assertion (A) : Figure -II is preferred over Figure - I as it avoids large changes in control signal for a sudden change in reference input.

Reason (R) : Placement of P - D action in the feedback path and larger values of $K_p$ and $T_d$ can be chosen in Figure - II.

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) : Schottky transistors are preferred over normal transistors in digital circuits.

Reason (R) : Schottky transistors operate in active and saturation region.

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) : Synchronous counter has higher speed of operation than ripple counter.

Reason (R) : Synchronous counter uses high speed flip - flops.

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 ring counter is preferred over a binary sequential counter.

Reason (R) : The decoding logic is simple for a ring counter.

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) : Op-amps with FET input stages have less gain than those with BJT.

Reason (R) : BJT has higher trans-conductance than FET.

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) : For equal outputs, the harmonic distortion is reduced in CE amplifier with the introduction of negative feedback.

Reason (R) : Nonlinear distortion usually arises due to signals traversing the large part of the dynamic characteristic, of the transistor at the output stage.

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) : Thyristors are preferred over power diodes in variable power rectifiers.

Reason (R) : Thyristors provide controlled rectification even though they have more power loss in comparison to power diodes.

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) : An on-off controller gives rise to oscillation of the output between two limits.

Reason (R) : Location of a pair of poles on the imaginary axis gives rise to self-sustained oscillation in the output.

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) : Feedback control systems offer more accurate control over open - loop systems.

Reason (R) : The feedback path establishes a link for input and output comparison and subsequent error correction.

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) : The largest undershoot corresponding to a unit step input to an underdamped second order system with damping ratio $\xi$ and undamped natural frequency of oscillation $\omega_n$ is $\dfrac{e^{2\pi}}{\sqrt{1-\xi^2}}$.

Reason (R) : The overshoots and under-shoots of a second order underdamped system is $\dfrac{e^{-n\pi}}{\sqrt{1-\xi^2}}$, $n=1,2,\ldots\ldots\ldots$

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) : Several satellites have been designed to operate in the Ku-band in spite of higher atmospheric absorption than the C - band.
Reason (R) : Use of smaller, narrower beam antennas in the Ku-band results in lower interference.
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) A knowledge of the amplitude and the phase of the field at each point at the mouth of a horn antenna may be used to predict the expected radiation pattern.
Reason (R) : The electromagnetic field at any point in space may be obtained by considering each point on a wave front as a source of spherical waves and superimposing the effect of all those sources at that point.
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) : Optical fibres have broader bandwidth compared to conventional copper cables.

Reason (R) : The information carrying capacity of optical fibres is limited by Rayleigh scattering loss.
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) : Most personal computers use static RAMs for their main memory.
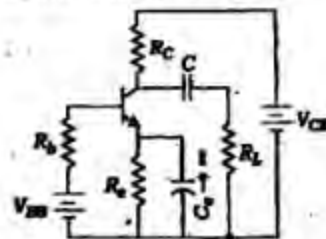Reason (R) : Static RAMs are much faster than dynamic RAMs.
a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true but R is NOT the correct explanation of A
c. A is true but R is false
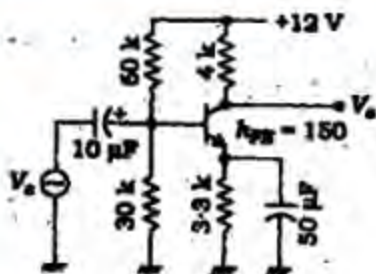d. A is false but R is true

46. Assertion (A) : LRU (Least Recently Used) replacement policy is not applicable to direct mapped caches.
Reason (R) : A unique memory page is associated with every cache page in direct mapped caches.
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

47. A common emitter amplifier circuit is shown in the given figure



The slope of a.c. load line is
a. $-\left(\dfrac{1}{R_L}+\dfrac{1}{R_C}\right)$
b. $-\left(\dfrac{1}{R_L+R_C}\right)$
c. $-\dfrac{1}{R_L}$
d. $-\dfrac{1}{R_C}$

48. An amplifier circuit is shown in the given figure :

The voltage gain ($V_0 / V_s$) is
a. 4 / 3.33
b. 100
c. 150
d. 160

49. Consider the following statements :
A totem pole configuration used in the output stage of an op-amp has the advantage of using
1. only n-p-n BJTs.
2. complementary symmetrical pair of transistors.
3. only one transistor.
Which of these statements is / are correct ?
a. 1 alone
b. 2 alone
c. 3 alone
d. 1 and 3

50. A 1 ms pulse can be stretched to 1 s pulse by using
a. an a stable multivibrator
b. a monostable multivibrator
c. a bistable multivibrator
d. a Schmitt trigger circuit

51. An FET is a better chopper than a BJT because it has
a. lower off - set voltage
b. higher series ON resistance.
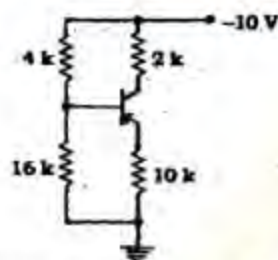c. lower input current
d. higher input impedance

52. Consider the following statements regarding the bootstrap biasing arrangement for a BJT emitter follower :
1. The input impedance is very high.
2. The voltage gain is exactly equal to one.
3. The output impedance is equal to zero.
Which of these statements is correct?
a. None
b. 2 alone
c. 3 alone
d. 1 alone

53.



In the circuit shown in the given figure, the approximate voltages at the transistor
a. base and emitter respectively are –8 V and –7.3 V
b. base and collector respectively are – 8 V and –5 V
c. collector and emitter respectively are – 5 V and –7.3 V
d. base, emitter and collector respectively are –8 V, –7.3 V and –5 V

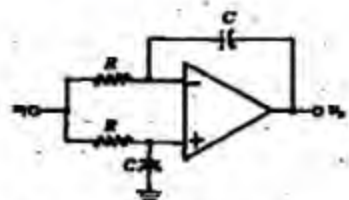54. Consider the following statements:
The lower cut - off frequencies for an RC coupled CE amplifier depend on
1. input and output coupling capacitors
2. emitter bypass capacitor
3. junction capacitors
Which of these statements is / are correct?
a. 1 alone
b. 2 alone
c. 1 and 2
d. 2 and 3

55.



The op - amp circuit shown in the given figure is
a. a high - pass circuit
b. a low - pass circuit
c. a band - pass circuit
d. an all - pass circuit

56. Consider the following statements :
Sziklai pair
1. is also called complementary Darlington
2. acts like a single p-n-p transistor with a very high current gain
3. can be used in class B push - pull power amplifier
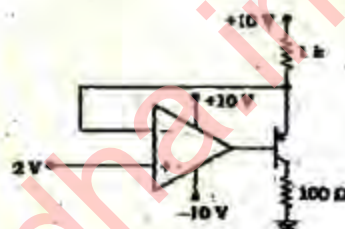Which of these statements are correct?
a. 1 and 2
b. 1 and 3

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

57. Which one of the following power amplifiers has the maximum efficiency?
a. Class A
b. Class B
c. Class AB
d. Class C

58. If a common emitter amplifier with an emitter resistance Re has an overall transconductance gain of $-1$ mA / V, a voltage gain of $-4$ and desensitivity of 50, then the value of the emitter resistance $R_e$ would be
a. 50 kΩ
b. 0.98 kΩ
c. 50 Ω
d. 0.98 Ω

59. The voltage gains of an amplifier without feedback and with negative feedback respectively are 100 and 20. The percentage of negative feedback (β) would be
a. 4%
b. 5%
c. 20%
d. 80%

60. If the Q of a single -stage single – turned is amplifier doubled, then its bandwidth will
a. remain same
b. become half
c. become double
d. become four times

61. An amplifier using BJT has two identical stages each having a lower cut-off (3 dB) frequency of 64 Hz due to coupling capacitor. The emitter bypass capacitor also provides a lower cut-off (3 dB) frequency due to emitter degeneration alone of 64 Hz. The lower (3 dB) frequency of the overall amplifier is nearly
a. 100 Hz
b. 128 Hz
c. 156 Hz
d. 244 Hz

62. Consider the following statements in relation to a large value of capacitor filter used in a full - wave rectifier :
It gives the
1. low conduction period for the diode rectifier
2. increased peak current rating of the diode
3. large peak inverse voltage rating of the diode

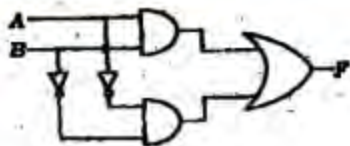Which of these statements are correct?
a. 1, 2 and 3
b. 2 and 3
c. 1 and 2
d. 1 and 3

63. In every practical oscillator, the loop gain is slightly larger than unity and the amplitude of the oscillations is limited by the
a. magnitude of the loop gain
b. onset of non - linearity
c. magnitude of the gain of the amplifier
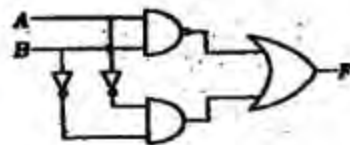d. feedback transmission factor

64. 



In the circuit shown in the given figure, the current flowing through resistance of 100 Ω would be
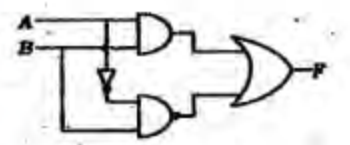a. 8 mA
b. 10 mA
c. 20 mA
d. 100 mA

65. The essential blocks of a phase lock loop (PLL) are phase detector, amplifier,
a. high - pass filter and crystal controlled oscillator
b. low - pass filter and crystal controlled oscillator
c. high-pass filter and voltage controlled oscillator
d. low - pass filter and voltage controlled oscillator

66. Which one of the following sets of circuits can be obtained by using a 555 timer?
a. Pulse modulator and amplitude demodulator
b. Pulse modulator and astable multivibrator
c. Amplitude demodulator and a.c. to d.c. converter
d. a.c. to d.c. converter and astable multivibrator

67. Which one of the following figures represents the coincidence logic?
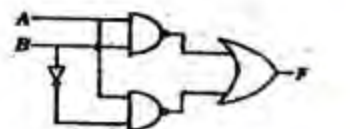a.

b.



c.



d.



68. The input voltage of Zener regulator varies from 20 V to 30 V. The load current varies from 10 mA to 15 mA. If the Zener voltage is 5 V, the value of series resistor will be
   a. 1 kΩ
   b. 1.5 kΩ
   c. 1.66 Ω
   d. 2.5 kΩ

69. A T- flip- flop function is obtained from a JK flip - flop. If the flip- flop belongs to a TTL family, the connection needed at the input must be
   a. $J = K = 1$
   b. $J = K = 0$
   c. $J = 1$ and $K = 0$
   d. $J = 0$ and $K = 1$

70. Karnaugh map is used to
   a. minimise the number of flip - flops in a digital circuit
   b. minimise the number of gates only in a digital circuit
   c. minimise the number of gates and fan - in of a digital circuit
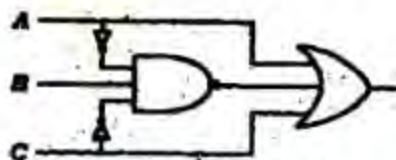   d. design gates

71.



Figure I

Which one of the following circuits is the minimised logic circuit for the circuit shown in Figure 1 ?
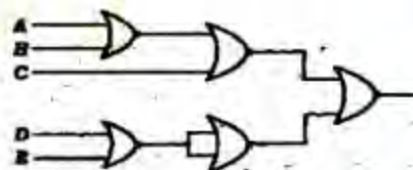
a.



b.



c.



d.



72. CE configuration is the mot preferred transistor configuration when used as a switch because it
   a. requires only one power supply
   b. requires low voltage or current
   c. is easily understood by every one
   d. has small $I_{CEO}$

73.



The circuit shown in the given figure realizes the function
   a. $\left(\overline{A+B}+C\right)\left(\overline{DE}\right)$
   b. $\left(\overline{A+B}+C\right)\left(D\overline{E}\right)$
   c. $\left(A+\overline{B+C}\right)\left(\overline{DE}\right)$
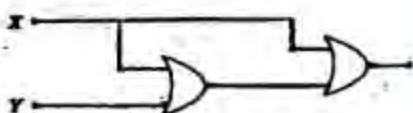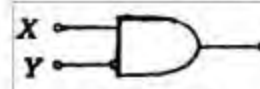   d. $\left(A+B+\overline{C}\right)\left(\overline{DE}\right)$

74.



Figure-I



Figure–II

The logic operations of two combinational circuits given in Figure – I and Figure – II are

a. entirely different
b. identical
c. complementary
d. dual

75. The thermal run - away in a CE transistor amplifier can be prevented by biasing the transistor in such a manner that

a. $V_{CE} > \dfrac{V_{CC}}{2}$

b. $V_{CB} < \dfrac{V_{CC}}{2}$

c. $V_{CE} = \dfrac{V_{CC}}{2}$

d. $V_{CE} = 0$

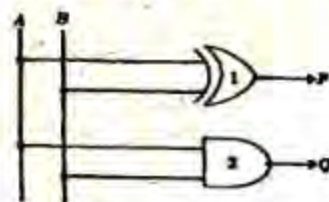76. The figure of merit, of a logic family is given by

a. gain x bandwidth
b. propagation delay time x power dissipation
c. fan -out x propagation delay time
d. noise margin x power dissipation

77. Which one of the following statements correctly defines the full -adder?
An adder circuit

a. having two inputs used to add two binary digits. It produced their sum and carry as input
b. having three inputs used to add two binary digits plus a carry. it produces their sum and carry as outputs
c. used in the least significant position when adding two binary digits with no carry-in to consider. It produces their sum and carry as outputs
d. having two inputs and two outputs

78. The half - adder circuit in the given figure has inputs AB = 11



The Logic level of P and Q outputs will be

a. P = 0 and Q = 0
b. P = 0 and Q = 1
c. P = 1 and Q = 0
d. P = 1 and Q = 1

79. Which one of the following can be used as parallel to series converter?

a. Decoder
b. Digital counter
c. Multiplexer
d. Demultiplexer

80. Consider the following statements :
A multiplexer

1. selects one of the several inputs and transmits it to a single output
2. routes the data from a single input to one of many outputs
3. converts parallel data into serial data
4. is a combinational circuit

Which of these statements are correct?

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

81. Consider the following statements

1. Race around conditions occurs in a JK flip - flop when both the inputs are one
2. A flip - flop is used to store one bit of information
3. A transparent latch consists of a D-type flip - flop
4. Master - slave configuration is used in flip - flops to store two bits of information

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

82. A ring counter consisting of five flip - flops will have

a. 5 states
b. 10 states
c. 32 states
d. infinite states

83. A crystal oscillator is frequently used in digital circuits for timing purposes because of its

a. lost cost
b. high frequency stability
c. simple circuitry
d. ability to set the frequency at the desired value

84. Which one of the following statements is correct?

a. RAM is a non - volatile memory whereas ROM is a volatile memory
b. RAM is a volatile memory whereas ROM is a non - volatile memory

c. Both RAM and ROM are volatile memories but in ROM data is not lost when power is switched off

d. Both RAM and ROM are non-volatile memories but in RAM data is lost when power is switched off

85. Match List I (Memory elements) with List II (Properties) and select the correct answer :

List I
A. Semiconductor memory
B. Ferrite core memory
C. Magnetic tape memory

List II
1. Destructive read out
2. Combinational logic
3. Volatile

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

86. Consider the following statements :
1. The effect of feedback is, to reduce the system error
2. Feedback increases the gain of the system in one frequency range but decreases in another
3. Feedback can cause a system that is originally stable to become unstable

Which of these statements are correct?
a. 1, 2 and 3
b. 1 and 2
c. 2 and 3
d. 1 and 3

87. The intersection of asymptotes of root-loci of a system with open - loop transfer function $G(s)H(s) = \dfrac{K}{s(s+1)(s+3)}$ is

a. 1.44
b. 1.33
c. − 1.44
d. − 1.33

88. Match list I (Functional components) with List II (Devices) and select the correct answer:

List I
A. Error detector
B. Servometer
C. Amplifier
D. Feedback

List II
1. Three-phase FHP induction motor
2. A pair of synchronous transmitter and control transformer
3. Tachogenerator
4. Armature controlled FHP d.c. motor
5. Amplidyne

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

89. Consider the following servomotors :
1. a.c. two - phase servomotor
2. d.c. servomotor
3. Hydraulic servomotor
4. Pneumatic servomotor

The correct sequence of these servomotors in increasing order of power handling capacity is
a. 2, 4, 3, 1
b. 4, 2, 3, 1
c. 2, 4, 1, 3
d. 4, 2, 1, 3

90. The open -loop transfer function of unity feedback control system is
$$G(s) = \dfrac{K}{s(s+a)(s+b)}, 0 < a \le b$$
The system is stable if
a. $0 < K < \dfrac{(a+b)}{ab}$
b. $0 < K < \dfrac{ab}{(a+b)}$
c. $0 < K < ab(a+b)$
d. $0 < K < a/b(a+b)$

91. The Routh − Hurwitz criterion cannot be applied when the characteristic equation of the system contains any coefficients which is
a. negative real and exponential functions of s
b. negative real, both exponential and sinusoidal functions of s
c. both exponential and sinusoidal functions of s
d. complex, both exponential and sinusoidal functions of s

92. Which one of the following characteristic equations can result in the stable operation of the feedback system?
a. $s^3 + 4s^2 - s - 6 = 0$
b. $s^3 - s^2 + 5s + 6 = 0$
c. $s^3 + 4s^2 + 10s + 11 = 0$
d. $s^4 + s^3 + 2s^2 + 4s + 6 = 0$

93. Match List I (Scientist) with List II (Contribution in the area of) and select the correct answer :

List I
A. Bode
B. Evans
C. Nyquist

List II
1. Asymptotic plots
2. Polar plots.
3. Root -locus technique
4. Constant M and N plots

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

94. Consider the following statements
Routh – Hurwitz criterion gives
1. absolute stability
2. the number of roots lying on the right half of the s - plane
3. the gain margin and phase margin
Which of these statements are correct?
a. 1, 2 and 3
b. 1 and 2
c. 2 and 3
d. 1 and 3

95. The open -loop transfer function G(s) of a unity feedback control system is $\dfrac{1}{s(s+1)}$

The system is subjected to an input r(t) = sin t. The steady- state error will be
a. Zero
b. 1
c. $\sqrt{2}\sin\left(t - \dfrac{\pi}{4}\right)$
d. $\sqrt{2}\sin\left(t + \dfrac{\pi}{4}\right)$

96. A second order system has the damping ratio $\xi$ and undamped natural frequency of oscillation $\omega_n$. The settling time at 2% tolerance band of the system is
a. $2/\xi\omega_n$
b. $3/\xi\omega_n$
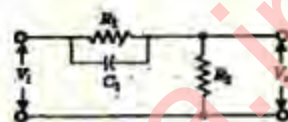c. $4/\xi\omega_n$
d. $\xi\omega_n$

97. The polar plot (for positive frequencies) for the open-loop transfer function of a unity feedback control system is shown in the given figure



The phase margin and the gain margin of the system are respectively
a. $150^0$ and 4
b. $150°$ and 3 / 4
c. $30°$ and 4
d. $30°$ and 3 / 4

98.



For the given network, the maximum phase lead $\phi_m$ of $V_o$ with respect to $V_i$ is

a. $\sin^{-1}\left(\dfrac{R_1}{2R_2}\right)$

b. $\sin^{-1}\left(\dfrac{R_1}{R_1 + 2R_2}\right)$

c. $\sin^{-1}\left(\dfrac{R_1}{R_1 + 3R_2}\right)$

d. $\sin^{-1}\left(\dfrac{R_1}{2R_2C_1}\right)$

99. Which one of the following equations represents the constant magnitude locus in G-plane for M = 1?
{x-axis is Re G(jω) and y-axis is Im G(jω)}
a. $x = -0.5$
b. $x = 0$
c. $x^2 + y^2 = 1$
d. $(x + 1)^2 + y^2 = 1$

100. Which one of the following features is NOT associates with. Nichols chart?
a. $(0 dB, -180°)$ point on Nichols charts represents the critical point $(-1 + j0)$
b. It is symmetric about $-180°$
c. The M loci are centred about $(0 dB, -180°)$ point
d. The frequency at the intersection of the G (jω) locus and M = +3 dB locus gives bandwidth of the closed - loop system
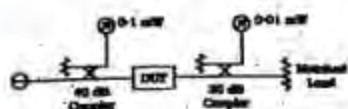
101. Consider the following statements :
A proportional plus derivative controller

1. has high sensitivity
2. increases the stability of the system
3. improves the steady - state accuracy

Which of these statements are correct?

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

102. Consider the following instructions executed in 8086.

PUSH AX; AX has 20 Hex in it
PUSH BX; BX has 34 Hex in it
POP AX.
ADD AX, BX;
POP G

The value stored in G would be

a. 20 Hex
b. 34 Hex
c. 54 Hex
d. 68 Hex

103. For a Gunn diode oscillator, the drift velocity of the electron is $10^7$ cm/s and the active region length is $10 \cdot 10^{-4}$ cm.

The natural frequency of oscillation would be

a. 1 MHz
b. 10 MHz
c. 1 GHz
d. 10 GHz

104. At microwave frequencies, a varactor diode may NOT be useful

a. for electronic tuning
b. for frequency multiplication
c. as an oscillator
d. as a parametric amplifier

105. The correct sequence of the assembled parts in a klystron amplifier from any end is

a. anode, catcher cavity, cathode and buncher cavity
b. cathode, buncher cavity, catcher cavity and anode
c. anode, buncher cavity, catcher cavity and cathode
d. cathode, catcher cavity, anode and buncher cavity

106. An amplifier network is unconditionally stable if

a. real part of $Z_{in}$ and $Z_{out}$ are greater than zero for some positive the source and load
b. real part of $Z_{in}$ and $Z_{out}$ out are greater than zero for all positive real impedances of the source and load

c. $Z_{in}$ and $Z_{out}$ are complex conjugates of each other for some positive real impedances of the source and load
d. $Z_{in}$ and $Z_{out}$ are complex conjugates of each other for all positive real impedances of the source and load

107. Consider the following statements :
If the narrow dimension of a standard rectangular waveguide carrying the dominant mode is reduced, then the

1. wave impedance will increase
2. attenuation will increase
3. guide wavelength will decrease
4. power handling capability will decrease.

Which of these statements are correct?

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

108. A quarter-wave transformer matching a 75Ω source with a 300 Ω load should have a characteristic impedance of

a. 50 Ω
b. 100 Ω
c. 150 Ω
d. 200 Ω

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

List I

A. Ratio of maximum energy stored to energy dissipated per cycle
B. TEM mode in a lossless medium
C. Ratio of frequency in radian to phase velocity of EM wave
D. $TE_{11}$ is the mode of lowest cut-off frequency

List II

1. Propagation constant
2. Cut-off frequency is zero
3. Quality factor of a cavity
4. Cylindrical waveguide

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

110. An antenna has 40 Ω antenna resistance and 60 Ω radiation resistance. The efficiency of the antenna is

a. 30%
b. 40%
c. 50%
d. 60%

111. For a microstrip with a substrate dielectric constant $\varepsilon$, the value of effective dielectric constant $\varepsilon_e$ will be such that

a. $\dfrac{\varepsilon}{2} < \varepsilon_e < \varepsilon$

b. $\dfrac{(\varepsilon+1)}{2} < \varepsilon_e < \varepsilon$

c. $1 < \varepsilon_e < \dfrac{(\varepsilon+1)}{2}$

d. $\dfrac{(\varepsilon-1)}{2} < \varepsilon_e < \dfrac{(\varepsilon+1)}{2}$

112.



The insertion loss of the Device Under Test (DUT) shown in the given figure is
a. 10 dB
b. 20 dB
c. 30 dB
d. 40 dB

113. In the standing wave detector method for measuring slightly mismatched load impedance, the distance from the load position to the nearest voltage minimum towards the generator is one - eighth the guide wavelength. The load is
a. a capacitive impedance
b. an inductive impedance
c. a pure capacitance
d. a pure inductance

114. If the peak power of pulsed microwave system is $10^4$ W and the average power is 800 W, then the duty cycle will be
a. 80%
b. 8%
c. 0.8%
d. 0.08%

115. A 8 kHz communication channel has an SNR of 30dB. If the channel bandwidth is doubled, keeping the signal power constant, the SNR for the modified channel will be
a. 27 dB
b. 30 dB
c. 33 dB
d. 60 dB

116. Consider the following parameters :
1. Loss is the media
2. Permeability of the media
3. Frequency of the wave
4. Velocity of the wave

Which of these parameters are responsible for the change of phase of a propagating electromagnetic wave?
a. 1, 2 and 3
b. 2, 3 and 4
c. 1, 3 and 4
d. 1 and 4

117. As a result of reflections from a plane conducting wall, electromagnetic waves acquire an apparent velocity greater than the velocity of light in space. This is called the
a. velocity of propagation
b. normal velocity
c. group velocity
d. phase velocity

118. While determining antenna, height for terrestrial microwave links, the effect of refraction from the atmosphere is taken care of by considering the effective curvature of the earth to be
a. 2/3 times the radius of the earth
b. 314 times the radius of the earth
c. 4/3 times the radius of the earth
d. 3/2 times the radius of the earth

119. An earth station employs a 1 kW high power amplifier (HPA) and a 20 m Cassegrain antenna whose transmitted gain is 65 dB at a free space wavelength of 2.1 cm. If the loss of the wavelength that connects HPA to the feed is 1dB, then the earth station EIRP is
a. 29 dB m
b. 59 dB m
c. 94 dB m
d. 124 dB m

120. Match List I (Microwave band) with List II (Frequency used in satellite communication) and select the correct answer :

List I
A. C-band
B. Ku -band
C. Ka-band

List II
1. 12 GHz to 14 GHz
2. 24 GHz to 26 GHz
3. 20 GHz to 30 GHz
4. 4 GHz to 6 GHz

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