

**ELECTRONICS & TELECOMMUNICATION
ENGINEERING
(OBJECTIVE TYPE)
PAPER – II**

INSTRUCTIONS

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2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. **DO NOT** write *anything else* on the Test Booklet
4. This Test Booklet contains 120 items (questions), 60 in PART – A and 60 in PART – B. Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
5. You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks
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- (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third (0.33)** of the marks assigned to that question will be deducted as penalty.
- (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.
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01. The threshold effect in demodulators is
 (a) The rapid fall of output SNR when the input SNR falls below a particular value
 (b) Exhibited by all the demodulators when the input SNR is low
 (c) Exhibited by all AM suppressed carrier coherent demodulators
 (d) Exhibited by correlation receivers

Ans : (a)

02. An amplitude modulated signal is
 $[A + 0.5 A \cos \omega_m t] \cos \omega_c t$ where ω_m and ω_c are respectively, modulating and carrier frequencies. The power efficiency is
 (a) 11.11% (b) 0.25% (c) 4.32% (d) 50%

Ans : (a)

03. The signal $x(t) = \sin(200 \pi t) + 2 \sin(400 \pi t)$ is modulated to produce a signal
 $g(t) = x(t) \sin(400 \pi t)$.
 This is passed through a low pass filter having a cut-off frequency of 400π Hz and pass band gain of 2. Then the output signal after the filter is
 (a) 0 (b) $0.5 \sin(200 \pi t)$ (c) $\sin(200 \pi t)$ (d) $2 \sin(200 \pi t)$

Ans : (b)

04. In communication systems, noise due to quantization error is
 (a) Linear and signal dependent
 (b) Non-linear and signal dependent
 (c) Linear and signal independent at low frequencies only
 (d) non-linear and signal dependent at low frequencies only

Ans : (a)

05. Match List I with List II and select the correct answer using the code given below the lists:

<u>List I</u>	<u>List II</u>
A. Characteristic impedance	1. $\nabla \cdot D = \rho_v$
B. Poynting vector	2. $\sqrt{\frac{j\omega\mu}{(\sigma + j\omega\epsilon)}}$
C. Displacement current	3. $E \times H$
D. Point form of Gauss law	4. $\frac{\partial D}{\partial t}$

Codes

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

Ans : (a)

06. For an earth station transmitter, with an antenna output power of 40dBW (10,000W), a back-off loss of 3dB, a total branching and feeder loss of 3dB, a total branching and feeder loss of 3dB and transmit antenna gain of 4dB, the effective isotropic radiated power (EIRP) will be
(a) 38dBW (b) 40 dBW (c) 36 dBW (d) 47 dBW

Ans : (a)

07. A coherent binary phase-shift-keyed (BPSK) transmitter operates at a bit rate of 20Mbps. For a probability of error $P(e)$ of 10^{-4} and given carrier-to-noise (C/N) density ratio of 8.8 dB, determine energy of bit-to noise (E_b/N_0) density ratio for a receiver bandwidth equal to the minimum double-sided Nyquist bandwidth.
(a) 23 dB (b) 2.3 dB (c) 8.8 dB (d) 0.88dB

Ans : (c)

08. An elliptically (arbitrarily) polarized wave can be broken up into
(a) Two circularly polarized components rotating in same direction
(b) Two circularly polarized components rotating in opposite directions
(c) Two stationary circularly polarized components
(d) None of these

Ans : (b)

09. Klystron operation is based on the principle of
(a) Velocity modulation (b) Amplitude modulation
(c) frequency modulation (d) Phase modulation

Ans : (a)

10. The following is not an application of varactor diode:
(a) Parametric amplifier (b) Frequency tuner
(c) Voltage controlled oscillator (d) Phase shifter

Ans : (d)

11. The following quantity is not required in the calculation of Q of a cavity resonator
(a) Energy stored (b) Power dissipated
(c) Loss in radiation (d) Dimensions of the cavity

Ans : (c)

12. When electromagnetic waves are propagated in a waveguide
(a) They travel along the walls of the waveguide
(b) They travel through the dielectric without touching the walls
(c) They are reflected from the walls but do not travel along the walls
(d) None of these

Ans : (b)

13. Slotted line with tunable probe is not used to measure
(a) VSWR (b) Wavelength (c) Power (d) Impedance

Ans : (c)

14. In a microwave magic-T, E plane and H plane are
(a) In phase (b) Out of phase (c) Isolated (d) 90° out of phase

Ans : (c)

15. Baratters and bolometers are used for measurement of
(a) VSWR (b) Transmission losses
(c) Microwave power (d) Frequency

Ans : (c)

16. Magnetic properties of ferrites result mainly from
(a) Polarization of electromagnetic waves
(b) Dielectric behaviour of ferrite
(c) Magnetic dipole moment associated with the electron spin
(d) External magnetic fields

Ans : (c)

17. A communication link is to be set up between two stations 100km apart using $\frac{\lambda}{2}$ antenna to transmit 1kW power. The operating frequency is 100 MHz and the directivity of the two antennae is 1.64. The maximum received power would be
(a) 3.06×10^{-8} W (b) 1.53×10^{-8} W (c) 6.12×10^{-9} W (d) 1×10^{-9} W

Ans : (b)

18. In the ionosphere layer, the lowest frequency signal that penetrates the layer upon vertical incidence is given by
(a) $f_L = 81 N_{\text{Max}}$ (b) $f_L = 81N_{\text{Max}}^2$ (c) $f_L = \sqrt{81N_{\text{Max}}}$ (d) $f_L = 81\sqrt{N_{\text{Max}}}$

Ans : (c)

19. An 8085 microprocessor executes the following instructions:
Two numbers are represented in signed 2's complement form as
P = 11101101 and Q = 11100110
If Q is subtracted from P, the value obtained in signed 2's complement form is
(a) 100000111 (b) 00000111 (c) 11111001 (d) 011111001

Ans : (b)

20. If $(11X1Y)_8 = (12C9)_{16}$ then the values X and Y are
(a) 5 and 1 (b) 5 and 7 (c) 7 and 5 (d) 1 and 5

No Answer (The correct answer is X = 3, Y = 1)

21. A small code of 8085 as given below, is executed
MVI A, 7FH
ORA A
CPI A2H
The contents of the accumulator and flags after execution are
(a) A = DD, S = 1, Z = 0, CY = 0 (b) A = 7F, S = 1, Z = 0, CY = 1
(c) A = DD, S=0, Z= 1, CY = 0 (d) A = 7F, S = 0, Z = 1, CY = 1

Ans : (b)

22. Following program finds absolute value of N:

```
MVI A, N
ORA A
JM ONE
OUT 01H
HLT
ONE: (P)
      (Q)
OUT 01H
HLT
```

The instructions of (P) and (Q) must be

- (a) CMA and ADI 0H (b) CMC and ADI 0H
(c) INR A and CMC (d) INR A and CMA

Ans : (a)

23. An Intel 8085 processor is executing the program given below:

```
MVI A, 10H
MVI B, 10H
BACK : NOP
      ADD B
      RLC
      JNC BACK
      HLT
```

The number of times that the operation NOP will be executed as

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

Ans : (c)

24. Match List I with List II and select the correct answer using the code given below the lists :

List I

List II

- A. Immediate
B. Implicit addressing
C. Register addressing
D. Direct addressing

1. LDA 30FF
2. MOV A, B
3. LXI H, 2050
4. RRC

Codes:

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

Ans : (a)

25. The Boolean equation $X = [(A + \bar{B})(B + C)]B$ can be simplified to

- (a) $X = \bar{A}B$ (b) $X = A\bar{B}$ (c) $X = AB$ (d) $X = \bar{A}\bar{B}$

Ans : (c)

26. For 8086 microprocessor, the jump distance in bytes for short jump range is
(a) Forward 255 and Backward 256 (b) Forward 127 and Backward 128
(c) Forward 31 and Backward 32 (d) Forward 15 and Backward 16

Ans : (b)

27. The action performed by the following instruction of 8086:
mov [1234h], AX
(a) Move contents of memory location 1234h to register AX
(b) Move the contents of register AX to memory offset 1234h
(c) Add contents at 1234h and AX
(d) Add contents of 1234h and AX and store the result in 1234h

Ans : (b)

28. While executing a program, 8085 microprocessor completes fetching of instruction JMP 2050 stored at address 2057H. The contents of the program counter after fetching the instruction would be
(a) 2050H (b) 2057 H (c) 205A H (d) 2051 H

Ans : (c)

29. For Opcode fetch operation in 8085 microprocessor
(a) $S_1 = 0, S_2 = 1, \overline{RD} = 0$, ALE high in T_1 (b) $S_1 = 1, S_2 = 1, \overline{RD} = 0$, ALE high in T_1
(c) $S_1 = 1, S_2 = 1, \overline{RD} = 0$, ALE high in T_2 (d) $S_1 = 0, S_2 = 1, \overline{RD} = 0$, ALE high in T_2

Ans : (b)

30. In a microprocessor, the service routine for a certain interrupt starts from a fixed location of memory which cannot be externally set, but the interrupt can be delayed or rejected. Such an interrupt is
(a) Non-maskable and non-vectored (b) Maskable and non-vectored
(c) Non-maskable and vectored (d) Maskable and vectored

Ans : (d)

31. A memory system has a total of 8 memory chips, each with 12 address lines and 4 data lines. The size of the memory system is
(a) 16k bytes (b) 32k bytes (c) 48 k bytes (d) 64k bytes

Ans : (a)

32. Consider the following statements for a DRAM:

1. Bit is stored as a charge.
2. It is made of MOS transistors.
3. Speed of DRAM is faster than processors.
4. Each memory cell requires six transistors

Which of these statements are correct

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

Ans : (a)

33. The access time of a cache memory is 100ns and that of main memory is 1 ms. 80% of the memory requests are for read and others are for write. Hit ratio for read only accesses is 0.9. A write through procedure is used. The average access time of the system for both read and write requests is
- (a) 200 ns (b) 360 ns (c) 720 ns (d) 1100ns

Ans : (b)

34. A virtual memory system has an address space of 8k words, a memory space of 4k words and page and block sizes of 1k words. The number of page faults using of 1k words. The number of page faults using LRU policy, for following page references is 10246215700
- (a) 5 (b) 7 (c) 9 (d) 10

Ans : (a)

35. Among memory types, the abbreviation MPDRAM stands for
- (a) Multi port Dynamic Random Access Memory
(b) Multipoint Dynamic Random Access Memory
(c) Multipoint Disk Random Access memory
(d) Multi port Dimensional Random Access memory

Ans : (a)

36. The following register holds the instruction before it goes to the decoder:
- (a) Control register (b) Accumulator (c) Address register (d) Data register

Ans : (d)

37. The incorrect match (when $n > 1$) is
- (a) SISD Model of computer : 1 control unit and 1 ALU
(b) SIMD Model of computer : 1 control unit and n ALUs
(c) MISD Model of computer : n control units and n ALUs
(d) MIMD model of computer : n control units and 1 ALU

Ans : (d)

38. In case the code is position dependent, the most suitable addressing mode is
- (a) Direct mode (b) Indirect mode (c) Relative mode (d) Indexed mode

Ans : (c)

39. The data structure needed to convert infix notation to prefix notation is
- (a) Queue (b) Stack (c) Tree (d) Graph

Ans : (b)

40. A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is
- (a) $\log_2 n$ (b) $n - 1$ (c) n (d) 2^n

Ans : (b)

41. In locations where the humidity is low, ICs based on one of the following technologies should be handled only after grounding the body. The technology is
- (a) TTL (b) CMOS (c) DTL (d) I^2L

Ans : (b)

42. If a feedback control system has its open-loop transfer function

$$G(s)H(s) = \frac{K}{[s(s+2)(s^2+2s+5)]}$$

the coordinates of the centroid of the asymptotes of its root-locus are

- (a) -1 and 0 (b) 1 and 0 (c) 0 and -1 (d) 0 and 1

Ans : (a)

43. Match List I with List II and select the correct answer using the code given below the lists:

List I

- A. HTL
B. CMOS
C. TTL
D. ECL

List II

1. High fan-out
2. Highest speed of operation
3. High noise immunity
4. Lowest product power and delay

Code:

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

Ans : (c)

44. The figure of merit of a logic family is given by

- (a) Gain bandwidth product
(b) (Propagation delay time) × (Power dissipation)
(c) (Fan-out) × (Propagation delay time)
(d) (Noise –margin) × (Power dissipation)

Ans : (b)

45. The correct expression is

- (a) $\overline{A}B + A\overline{B} = \overline{A}B(A + B)$ (b) $\overline{A}B + \overline{A}B = AB(\overline{A} + \overline{B})$
(c) $\overline{A}B + A\overline{B} = AB(\overline{A} + \overline{B})$ (d) $\overline{A}B + \overline{A}B = \overline{A}B(A + 1)$

Ans : (a)

46. Binary data is being represented in size of byte and in 2's complement form. The number of 0's present in representation of $(-127)_{\text{DECIMAL}}$ IS

- (a) 8 (b) 7 (c) 6 (d) 5

Ans : (c)

47. Simplified form of the logic expression

$$(A + \overline{B} + C)(A + \overline{B} + \overline{C})(A + B + C)$$

- (a) $\overline{A}B + \overline{C}$ (b) $A + \overline{B}C$ (c) A (d) $AB + \overline{C}$

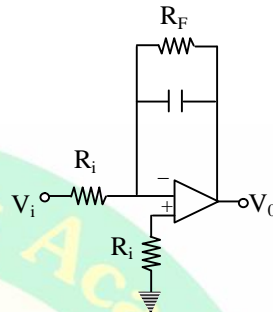
Ans : (b)

48. For a transistor used as a switch, t_d is delay time, t_r is rise time, t_s is storage time and t_f is fall time. Then turn-on time t_{ON} and turn-off time t_{OFF} are respectively
- (a) $(t_d + t_s)$ and $(t_r + t_f)$ (b) $(t_d + t_r)$ and $(t_s + t_f)$
(c) $(t_r + t_s)$ and $(t_d + t_f)$ (d) $(t_d + t_r)$ and $(t_s + t_f)$

Ans : (d)

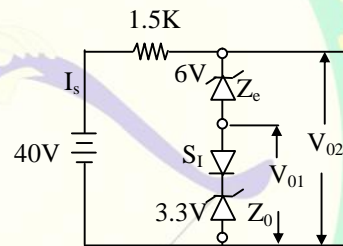
49. In the circuit shown, the need of the resistor R_F is

- (a) To increase the overall gain
(b) To stabilize the circuit
(c) To increase input impedance
(d) To prevent saturation



Ans : (b)

50. A 40V dc supply is connected across the network comprising of zener and silicon diode as shown. The regulated voltages V_{01} , V_{02} and source current I_s are
- (a) 2.4V, 5.1 V and 21.7mA
(b) 3V, 6V and 22.7mA
(c) 3.3V, 9.3V and 20.5mA
(d) 4V, 10V and 20mA



Ans : (c)

51. For a full wave rectifier , with sinusoidal input and inductor as filter, ripple factor for maximum load current and minimum load current conditions are respectively
- (a) 0.1 and 1 (b) 0.1 and 0.47 (c) 0 and 0.47 (d) 0 and 0.22

Ans : (c)

52. The second-harmonic component in the output of a transistor amplifier, without feedback, is B_2 . The second harmonic component, with negative feedback B_2 is equal to (where A = Amplifier gain and β = feedback factor)

- (a) $\frac{B_2}{1 + A\beta}$ (b) $B_2 (1 + A\beta)$ (c) $\frac{B_2}{\beta}$ (d) $\frac{B_2}{A\beta}$

Ans : (a)

53. The lower 3dB frequency of an n-stage amplifier with non-interacting stages is given by

- (a) $\frac{f_L}{\sqrt{2^{\frac{1}{n}} - 1}}$ (b) $f_L \left[\sqrt{2^{\frac{1}{n}} - 1} \right]$ (c) $\frac{f_L}{\sqrt{2^{\frac{1}{n}} - n}}$ (d) $f_L \left[\sqrt{2^{\frac{1}{n}} - n} \right]$

Where f_L is the 3dB frequency of a single stage.

Ans : (a)

54. An output signal of a power amplifier has amplitudes of 2.5V fundamental, 0.25V second harmonic and 0.1V third harmonics. The total percentage harmonic distortion of the signal is
 (a) 12.8% (b) 10.8% (c) 6.4% (d) 1.4%

Ans : (c)

55. A change in the value of the emitter resistance R_e in a differential amplifier
 (a) Affects the difference mode gain, A_d
 (b) Affects the common mode gain, A_c
 (c) Affects both A_d and A_c
 (d) Does not affect either A_d or A_c

Ans : (b)

56. In a transistor biased in the active region, thermal runaway is due to
 (a) Base emitter voltage V_{BE} which decreases with rise in temperature
 (b) Change in reverse collector saturation current due to rise in temperature
 (c) Heating the transistor
 (d) Changes in β which increases with temperature

Ans : (b)

57. A transistor is said to be useful to be configured as an amplifier when its β is
 (a) less than 0 (b) Between 0 and 1 (c) Between 1 and 50 (d) > 50

Ans : (d)

58. A BJT is biased with a power supply of 12V. For minimum heat dissipation, the drop across the transistor will be
 (a) 6V (b) 9V (c) 12V (d) $> 9V$ but $< 12V$

Ans : (a)

59. A bipolar junction transistor with forward current transfer ratio $\alpha = 0.98$, when working in CE mode, provides current transfer ratio β as
 (a) 98 (b) 0.02 (c) 49 (d) 0.49

Ans : (c)

60. Match List I with List II and select the correct answer using the code given below the lists:

List I

- A. Tuned circuits
 B. Voltage reference
 C. High frequency switch
 D. Current controlled attenuator

List II

1. Schottky diode
 2. Varactor diode
 3. PIN diode
 4. Zener diode

Code:

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

Ans : (a)

61. Assuming that only logic inputs X and Y are available and their complements \bar{X} and \bar{Y} are not available, the minimum number of two-input NAND gates required to implement $X \oplus Y$ would be

- (a) 2 (b) 3 (c) 4 (d) 5

Ans : (c)

62. The minimum number of NAND gates required to implement $A + \bar{A}\bar{B} + \bar{A}\bar{B}C$ is equal to

- (a) Zero (b) 1 (c) 4 (d) 7

Ans : (a)

63. The type of device used to interface a parallel data format with external equipment's serial format is

- (a) Key matrix (b) UART (c) Memory chip (d) Serial-in, parallel –out

Ans : (b)

64. A bistable multi-vibrator that functions as a voltage comparator with hysteresis is called

- (a) T flip-flop (b) D flip-flop (c) J-K flip-flop (d) Schmitt trigger

Ans : (d)

65. The characteristic equation of the T flip-flop is given by

- (a) $Q_{n+1} = TQ_n$ (b) $Q_{n+1} = T\bar{Q}_n + Q_n\bar{T}$
(c) $Q_{n+1} = \bar{T}Q_n$ (d) $Q_{n+1} = T\bar{Q}_n$

Ans : (b)

66. A pulse train with a frequency of 1MHz is counted using a mod-1024 ripple counter built with J-K flip-flops. For proper operation of the counter the maximum permissible propagation delay per flip-flop stage is

- (a) 100ns (b) 50 ns (c) 20 ns (d) 10ns

Ans : (a)

67. The highest speed counter is

- (a) Asynchronous counter (b) Synchronous counter
(c) Ripple counter (d) Ring counter

Ans : (b)

68. An analog voltage of 3.41V is converted into 8-bit digital form by an A/D converter with a reference voltage of 5V. The digital output is

- (a) 1001 1001 (b) 1111 0001 (c) 1011 0111 (d) 1010 1110

Ans : (d)

69. Match list I with List II and select the correct answer using the code given below the lists:

List I

- A. 555
- B. 74173
- C. 74163
- D. 8097

List II

- 1. Microcontroller
- 2. Register
- 3. Timer
- 4. Counter

Code:

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

Ans : (c)

70. In which of the following type of A/D converter does the conversion time almost double for every bit added to the device?

- (a) Counter type A/D converter
- (b) Tracking type A/D converter
- (c) Single-slope integrating type A/D converter
- (d) Successive approximation type A/D converter

Ans : (a)

71. If both inputs of S-R NAND latch are low, the output will be

- (a) Unpredictable
- (b) Toggle
- (c) Reset
- (d) Remain same

Ans : (a)

72. A 10-bit DAC provides an analog output which has a maximum value of 10.23 volts. Resolution of the DAC is

- (a) 10 mV
- (b) 15 mV
- (c) 20 mV
- (d) 40 mV

Ans : (a)

73. Consider the following statements regarding registers and latches:

- 1. Registers are temporary storage devices, whereas latches are not.
- 2. A latch employs cross-coupled feedback connections.
- 3. A register stores a binary word, whereas a latch does not.

The correct statement(s) is/are

- (a) 1 only
- (b) 2 only
- (c) 1 and 3
- (d) 2 and 3

Ans : (d)

74. Match List I with List II and select the correct answer using the code given below the lists:

- List I**
- A. Flash converter ADC
 - B. Successive approximation ADC
 - C. Counter ramp ADC
 - D. Dual slope ADC

- List II**
- 1. Integrating type
 - 2. Fast conversion
 - 3. Maximum conversion clock periods =
Number of bits
 - 4. Uses a DAC in its feedback path

Codes:

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

Ans : (a)

75. A 12-bit ADC is operating with a 1 μ s clock period and total conversion time is seen to be 14 μ s. The ADC must be of

- (a) Flash type
- (b) Counting type
- (c) Integrating type
- (d) Successive approximately type

Ans : (a)

76. The type of system which is used for determination of static error constants is determined from the number of

- (a) Zeros at origin for open loop transfer function
- (b) Poles at origin for open loop transfer function
- (c) Zeros at origin for closed loop transfer function
- (d) Poles at origin for closed loop transfer function

Ans : (b)

77. The time taken for the output to settle within $\pm 2\%$ of step input for the control system represented by $\frac{25}{s^2 + 5s + 25}$ is given by

- (a) 1.2 s
- (b) 1.6 s
- (c) 2.0 s
- (d) 0.4 s

Ans : (b)

78. The following quantities give a measure of the transient characteristics of a control system, when subjected to unit step excitation:

- 1. Maximum overshoot
 - 2. Maximum undershoot
 - 3. Overall gain
 - 4. Delay time
 - 5. Rise time
 - 6. Fall time
- (a) 1, 3 and 5
 - (b) 2, 4 and 5
 - (c) 2, 4 and 6
 - (d) 1, 4 and 5

Ans : (d)

79. In a feedback control system, if

$$G(s) = \frac{4}{s(s+3)} \text{ and } H(s) = \frac{1}{s}, \text{ then the closed-loop system will be of type}$$

- (a) 3 (b) 2 (c) 1 (d) 0

Ans : (d)

80. For a second order dynamic system, if the damping ratio is 1 then the poles are

- (a) Imaginary and complex conjugate (b) In the right-half of s-plane
(c) Equal, negative and real (d) Negative and real

Ans : (c)

81. The spectral density and autocorrelation function of white noise is

- (a) Delta and uniform (b) Uniform and delta
(c) Gaussian and uniform (d) Gaussian and delta

Ans : (b)

82. The average information associated with an extremely likely message is zero. What is the average information associated with an extremely unlikely message?

- (a) Zero
(b) Infinity
(c) Depends on total number of messages
(d) Depends on speed of transmission of the message

Ans : (b)

83. The effect of integral controller on the steady state error (e_{ss}) and on the relative stability (R_s) of the system are

- (a) Both are increased (b) e_{ss} is increased but R_s is reduced
(c) e_{ss} is reduced but R_s is increased (d) Both are reduced

Ans : (d)

84. A proportional integral (PI) controller results in which of the following?

- (a) Improves the transient response without affecting steady state response
(b) Improves the steady state response without affecting transient response
(c) Improves both transient response and steady state response
(d) Improves the steady state response while marginally affecting transient response, for well designed control parameters

Ans : (d)

85. A liquid level controller linearly converts a displacement of 2 m to 3 m into 4–20 mA control signal. A relay serves as two position controller to open and close an inlet valve. Relay closes at 12 mA and opens at 10 mA. The hysteresis zone is

- (a) 0.1 m (b) 0.125 m (c) 0.15 m (d) 0.2 m

Ans : (c)

86. The necessary conditions for poles and zeros of the transfer function of a bridge-T network containing only resistors and capacitors and used as a compensator are

- (a) All the poles and zeros must be imaginary
(b) Poles and zeros both can be complex
(c) Poles can be complex but zeros must be real
(d) Zeros can be complex but poles must be real

Ans : (d)

87. Considering the filtering property, the lead compensators and lag compensators are categorized respectively as
- (a) Low pass and high pass filters (b) High pass and low pass filters
 (c) High pass and high pass filters (d) Low pass and low pass filters

Ans : (b)

88. Match List I with List II and select the correct answer using the code given below the lists:

List I

- A. PI control
 B. PD control
 C. PID control
 D. On-off control

List II

1. Relay controller
 2. Lead lag compensator
 3. Lead compensator
 4. Lag compensator

Codes:

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

Ans : (c)

89. A phase lead compensating network has its transfer function $G_c(s) = \frac{10(1+0.04s)}{(1+0.01s)}$. The maximum phase lead occurs at a frequency of
- (a) 50 rad/s (b) 25 rad/s (c) 10 rad/s (d) 4 rad/s

Ans : (a)

90. A third order system is approximated to an equivalent second order system. The rise time of this approximated system will be
- (a) Same as the original system for any input
 (b) Smaller than the original system for any input
 (c) Larger than the original system for any input
 (d) Smaller or larger depending on the type of input

Ans : (b)

91. The constant magnitude locus for $M = 1$, in G-plane is given by the following equation where $x = \text{Re}[G(j\omega)]$ and $y = \text{Im}[G(j\omega)]$
- (a) $x = -0.5$ (b) $x = 0$ (c) $x^2 + y^2 = 0.25$ (d) $x^2 + y^2 = 1$

Ans : (a)

92. All the constant $-N$ loci in G-plane intersect the real axis in points
- (a) -1 and origin (b) -0.5 and $+0.5$ (c) -1 and $+1$ (d) Origin and $+1$

Ans : (a)

93. For a unity feedback control system, if its open-loop transfer function is given by $G(s)$
- $$H(s) = \frac{10}{(s+5)^3}$$
- , then its gain margin will be

- (a) 20 dB (b) 40 dB (c) 60 dB (d) 80 dB

Ans : (b)

94. The gain cross-over frequency and phase margin of the transfer function $\frac{1}{s(s+1)}$ are

- (a) 1 rad/s and 45° (b) 2 rad/s and 45°
 (c) 2 rad/s and 135° (d) 1 rad/s and 135°

Ans : (a)

95. For a type 1 system, the low frequency asymptote of its Bode plot will have a slope of
 (a) 0 dB/decade (b) 6 dB/decade (c) 20 dB/decade (d) -20 dB/decade

Ans : (d)

96. The characteristic equation of a particular system is given by $s^3 + 2s^2 + 6s + 12 = 0$. The damping ratio δ will be

- (a) $\delta = 0$ (b) $0 < \delta < 1$ (c) $\delta = 1$ (d) $\delta > 1$

Ans : (a)

97. If root loci plots of a particular control system do not intersect the imaginary axis at any point, then the gain margin of the system will be

- (a) Zero (b) 0.707 (c) 1.0 (d) Infinite

Ans : (d)

98. A system is described by the transfer function $G(s) = \frac{2s+5}{(s+5)(s+4)}$. The dc gain of the system is

- (a) 0.25 (b) 0.5 (c) 1 (d) ∞

Ans : (a)

99. The sensitivity $S_T(K)$ of transfer function $T = \frac{1+2K}{3+4K}$ with respect to the parameter K is given by

- (a) $\frac{K}{3+K^2}$ (b) $\frac{3K}{2+4K+K^2}$
 (c) $\frac{2K}{3+10K+8K^2}$ (d) $\frac{4K}{2+5K+7K^2}$

Ans : (c)

100. The range of K for stability of a unity feedback system whose open-loop transfer function is $G(s) = \frac{K}{s(s+1)(s+2)}$ is

- (a) $0 < K < 3$ (b) $0 < K < 6$ (c) $K > 6$ (d) $0 > K > 3$

Ans : (b)

101. For the 8085 assembly language program given below, the content of the accumulator after the execution of the program is

```
3000 MVI A, 45H
3002 MOV B, A
3003 STC
3004 CMC
3005 RAR
3006 XRA B
3007 HLT
```

- (a) 00 H (b) 45 H (c) 67 H (d) E7 H

Ans : (c)

102. The 8254 Programmable Interval Timer is set to work in MODE 5. The following would best describe its function:

- (a) Software triggered strobe (b) Hardware triggered strobe
(c) Square wave generator (d) Interrupt on terminal count

Ans : (b)

103. To configure port A and port B as output ports, port C not being used in the 8155 programmable interface, the control word should have the value

- (a) 03H (b) 01H (c) 02H (d) 60H

Ans : (a)

104. The 8085 microprocessor instructions with required number of T states are given below. Which pair is correctly matched?

- (a) STAX: 8 T-states (b) SPHL : 6 T-states
(c) SIM : 7 T-states (d) STA : 12 T-states

Ans : (b)

105. The crystal frequency of 8085 microprocessor is 6 MHz. The time required to execute instruction XTHL over this microprocessor is

- (a) 5.33 μsec (b) 10.67 μsec (c) 4.33 μsec (d) 8.67 μsec

Ans : (a)

106. In 8085 microprocessor, after the execution of RST 5 instruction, the program control shifts to

- (a) 0030 H (b) 0005 H (c) 0028 H (d) 0024 H

Ans : (c)

107. Consider the following 8085 interrupts:

1. TRAP 2. INTR
3. RST 6 4. RST 7.5
5. RST 0

The software interrupts are

- (a) 1 and 3 only (b) 2 and 5 only (c) 3 and 5 only (d) 1,2,3,4 and 5

Ans : (c)

Directions: Each of the next thirteen (13) items consists of two statements, one labelled as the 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but Statement (II) is *not* the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

108. **Statement (I) :** In a transistor designed to be used for power amplification, the collector size is largest relative to the emitter and base.

Statement (II) : The collector is connected to the body of the transistor and hence to a heat sink for heat dissipation to be effective.

Ans : (a)

109. **Statement (I) :** The carry look-ahead adder is a fast adder

Statement (II) : The carry look-ahead adder generates the carry and the sum digits directly.

Ans : (a)

110. **Statement (I) :** Root loci are symmetrical with respect to real axis of the s-plane.

Statement (II) : Root loci are normally symmetrical with respect to the perpendicular axis of symmetry of the pole-zero combination of the loop transfer function.

Ans : (c)

111. **Statement (I) :** Nyquist criterion is a powerful tool to determine stability of a closed loop system using open loop transfer function.

Statement (II) : Nyquist criterion relates the locations of poles and zeros of the closed loop transfer function.

Ans : (c)

112. **Statement (I) :** A second order system subjected to a unit impulse oscillates at its natural frequency.

Statement (II) : Impulse input contains frequencies from $-\infty$ to $+\infty$.

Ans : (d)

113. **Statement (I) :** All the systems which exhibit overshoot in transient response will also exhibit resonance peak in frequency response.

Statement (II) : A large resonance peak in frequency response corresponds to a large overshoot in transient response.

Ans : (a)

114. **Statement (I) :** In a prototype second order system the rise time t_r and bandwidth are inversely proportional.

Statement (II) : Increasing ω_n increases bandwidth while t_r reduces.

Ans : (a)

115. **Statement (I)** : The phase angle plot in Bode diagram is not affected by the variation in open loop gain of the system.

Statement (II) : The variation in gain of the system has no effect on the phase margin.

Ans : (c)

116. **Statement (I)** : FM spectrum consists of a carrier and an infinite number of side band components.

Statement (II) : FM signals are used only in TV transmission to ensure better picture quality.

Ans : (c)

117. **Statement (I)** : In the two body system consisting of the earth and a satellite, centre of mass always coincides with centre of the earth.

Statement (II) : Mass of earth is much greater than mass of satellite.

Ans : (a)

118. **Statement (I)** : Gunn effect device is a slice made from n-doped GaAs and provides negative resistance characteristics.

Statement (II) : GaAs has an empty energy band higher in energy than the filled or partly filled bands.

Ans : (b)

119. **Statement (I)** : Power output of the lowest mode in a reflex klystron is maximum.

Statement (II) : Lower modes occur at higher repeller voltages where the acceleration of bunched electrons on return is maximum.

Ans : (d)

120. **Statement (I)** : The DMA technique is more efficient than the Interrupt-driven technique for high volume I/O data transfer.

Statement (II) : The DMA technique does not make use of the Interrupt mechanism.

Ans : (b)

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