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Booklet Serial No.

001821

Test Booklet Series

TEST BOOKLET - 2022

ELECTRONICS AND COMMUNICATION

LECTURER I

(11)

A

Time Allowed: Two Hours

Maximum Marks: 100

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES **NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.
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 100 items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Response 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 Response Sheet provided. See directions in the Response Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Response sheet the response to various items in the Test Booklet you have to fill in some particulars in the Response Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator **only the Response Sheet**. You are permitted to take away with you the Test Booklet and Candidate's Copy of the Response Sheet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong answers:**
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE.
 - (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, 0.25 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 for that question.
 - (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be no **penalty** for that question.

SEAL

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6. The conversion efficiency of Class-A and Class-B power amplifiers are, respectively,
- A) 68.5% and 50% B) 78.5% and 50%
- C) 50% and 68.5% D) 50% and 78.5%

7. Consider the following statements:

Assertion (A): In a multistage amplifier, transformer coupling increases the overall gain.

Reason (R): In transformer coupling, efficient impedance matching is a critical requirement for maximum power transfer.

The correct answer is

- A) A and R are both correct and R is the correct explanation of A
- B) A and R are both correct and R is NOT the correct explanation of A
- C) A is correct, but R is NOT correct
- D) A is NOT correct, but R is correct

8. Find the correct match.

- a) Phase Shift Oscillator - 1. LC Oscillator
- b) Wien Bridge Oscillator - 2. RC Oscillator
- c) Colpitts Oscillator - 3. Lead-lag Network

The correct match is,

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

9. In a class-C tuned amplifier, the output signal is obtained for,
- A) The below 90° for a full input cycle
- B) Less than a full cycle for a full input cycle
- C) Less than half a cycle for a full input cycle
- D) In between the half and full cycle for a full input cycle

10. A type of clipper that removes a small portion of the negative half-cycle of the input signal is,
- A) Unbiased negative clipper B) Biased negative clipper
C) Biased positive clipper D) Unbiased positive clipper
11. Identify the wrong ideal characteristics of the operational amplifier.
- A) Infinite voltage gain B) Infinite output resistance
C) Infinite bandwidth D) Infinite CMRR
12. For the circuit values of $R_1=1\text{ K}\Omega$ and $R_f=10\text{ K}\Omega$, find the gain of an inverting operational amplifier.
- A) -1 B) 10
C) 1 D) -10
13. Which is not an application of an operational amplifier-based comparator?
- A) Zero crossing detector B) Window detector
C) Summer D) Phase Meter
14. Maxwell's inductance capacitance bridge is used for measuring,
- A) Capacitance B) Resistance
C) Inductance D) Voltage
15. Two Wattmeters connected to measure the input to a balanced 3-phase circuit indicate 2000 W and 500 W respectively. Find the power factor of the circuit when both readings are positive.
- A) 0.696 B) 0.969
C) 0.796 D) 0.979

42. The Z-parameters of a two-port network are, $Z_{11} = 10 \Omega$, $Z_{12} = Z_{21} = 5 \Omega$, and $Z_{22} = 20 \Omega$. Find the equivalent T-network.

- A) $Z_1 = 15 \Omega$, $Z_2 = 15 \Omega$, $Z_3 = 15 \Omega$ B) $Z_1 = 5 \Omega$, $Z_2 = 15 \Omega$, $Z_3 = 15 \Omega$
C) $Z_1 = 15 \Omega$, $Z_2 = 5 \Omega$, $Z_3 = 15 \Omega$ D) $Z_1 = 5 \Omega$, $Z_2 = 5 \Omega$, $Z_3 = 15 \Omega$

43. A T-type attenuator is a symmetrical network and also a/an,

- A) Balanced network B) Unbalanced network
C) Reciprocal network D) Non-reciprocal network

44. Consider the following statements:

Assertion (A): A wide variety of extruded aluminum heat sinks are commercially available to increase heat transfer capability.

Reason (R): The heat generated within the power device must be transferred from the device to a cooling medium to maintain the operating junction temperature within the specified range.

The correct answer is

- A) A and R are both correct and R is the correct explanation of A
B) A and R are both correct and R is NOT the correct explanation of A
C) A is correct, but R is NOT correct
D) A is NOT correct, but R is correct

45. What are the ways used to turn on a Thyristor?

1. Light
2. High voltage
3. Gate current
4. Sound

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

46. A minimum anode current required to maintain the Thyristor in the on-state is called,
- A) Forward current B) Holding current
 C) Reverse current D) ON current

47. The classification of phase-control converters is given in the list.

- a. Semi converter- 1. One-quadrant converter
 b. Full converter- 2. Four-quadrant converter
 c. Dual converter- 3. Two-quadrant converter

The correct match is,

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

48. The single-phase dual converter is operated from a 120 V, 60 Hz supply and the load resistance is 10Ω . The circulating inductance is 40 mH; delay angles are $\alpha_1 = 60^\circ$ and $\alpha_2 = 120^\circ$. Calculate the peak circulating current of converter 1.

- A) 2.25 A B) 13.25 A
 C) 4.25 A D) 11.25 A

49. The input voltage to a single-phase cycloconverter is 120 V (rms), 60 Hz. The load resistance is 5Ω and the load inductance is 40 mH. The frequency of the output voltage is 20 Hz. If the converters are operated as semi converters such that $0 \leq \alpha \leq \pi$. and the delay angle is $2\pi/3$, determine the rms value of output voltage.

- A) 60 V B) 53 V
 C) 120 V D) 83 V

50. In the 8085 microprocessor, if any arithmetic or logical operation generates carry by D_3 and passes it to D_4 , this flag becomes set.

- A) Direction flag B) Auxiliary carry flag
 C) Parity flag D) Zero flag

59. The on-chip program memory (ROM) of 8051 microcontrollers is,
- A) 128 Kbytes B) 8 Kbytes
C) 4 Kbytes D) 2 Kbytes
60. How many 8-bit bidirectional bit addressable I/O ports are available in the 8051 microcontrollers?
- A) 1 B) 2
C) 3 D) 4
61. Identify the addressing mode of the 8051 microcontroller instruction – ADD A, #100.
- A) Immediate addressing mode B) Register addressing mode
C) Indirect addressing mode D) Indexed addressing mode
62. In 8051 programming, how to represent 8-bit internal data RAM address addressed indirectly using one of the registers R_0 or R_1 .
- A) $\$R_1$ B) $\#R_1$
C) $@R_1$ D) $\&R_1$
63. Identify the flow control service provided by the respective layer/layers in the OSI model.
- | | |
|-----------------------|--------------------|
| 1. Data Link Layer | 2. Network Layer |
| 3. Presentation Layer | 4. Transport Layer |
- A) 2, 3 and 4 only B) 2 and 3 only
C) 1 and 4 only D) 1, 2 and 3 only
64. Find a protocol that is not defined by the transport layer in TCP/IP model from the given list.
- A) Transmission Control Protocol (TCP)
B) Internet working Protocol (IP)
C) User Datagram Protocol (UDP)
D) Stream Control Transmission Protocol ((SCTP)

65. Find the error, if any, in the IPv4 addresses 75.45.301.14.
- A) Each number needs to be less than or equal to 255 (301 is outside this range)
 - B) In the second number, 45 is not permitted
 - C) There must be five numbers (only four numbers are there)
 - D) There must be a leading zero in the fourth number as 014.
66. Which firewall uses a filtering table to decide which packets must be discarded?
- A) Client firewall
 - B) Network firewall
 - C) Proxy firewall
 - D) Packet filter firewall
67. Find the class of the IP address 14.23.120.8.
- A) The first byte is between 0 and 127; the class is B
 - B) The first byte is between 0 and 127; the class is A
 - C) The second byte is between 0 and 127; the class is E
 - D) The second byte is between 0 and 127; the class is C
68. Consider the following statements:
- Assertion (A): The semiconductor injection laser diode is preferred over the LED in optical fiber communication.
- Reason (R): Injection laser diodes are suitable for optical fiber communication systems requiring bandwidths greater than approximately 200 MHz
- The correct answer is
- A) A and R are both correct and R is the correct explanation of A
 - B) A and R are both correct and R is NOT the correct explanation of A
 - C) A is correct, but R is NOT correct
 - D) A is NOT correct, but R is correct
69. Identify the band of the wavelengths (1460 to 1530 nm) that are in between the C-band and E-band.
- A) Short band (S-band)
 - B) Original band (O-band)
 - C) Long band (L-band)
 - D) Ultra-long band (U-band)

70. Which is not an advantage of optical fibers?
- A) Long Distance Transmission B) Large Information Capacity
C) Immunity to Electrical Interference D) Worst Safety
71. Consider a multimode fiber that has a core refractive index of 1.480 and a core-cladding index difference of 2.0 percent ($D = 0.020$). Find the numerical aperture.
- A) 0.825 B) 0.296
C) 0.796 D) 0.962
72. Consider a graded-index multimode fiber for which the index profile $\alpha=2.0$, the core index $n_1 = 1.480$, the core-cladding index difference $\Delta = 0.01$, and the core radius $a = 25$ mm. If the radius of curvature of the fiber is $R = 1.0$ cm, what percentage of the modes remain in the fiber at a 1300-nm wavelength?
- A) 42% B) 84%
C) 21% D) 13%
73. Which is/are not the LED configuration(s) being used for fiber optics?
1. Surface emitters
 2. Edge emitters
 3. Half-power emitters
 4. Full-power emitters
- A) 2 and 3 B) 3 and 4
C) 3 only D) 1 and 4
74. A photodiode is constructed of GaAs, which have bandgap energy of 1.43 eV at 300 K. What is the cutoff wavelength of this device?
- A) 369 nm B) 689 nm
C) 869 nm D) 669 nm
75. A silicon avalanche photodiode has a quantum efficiency of 65 percent at a wavelength of 900 nm. Suppose $0.5 \mu\text{W}$ of optical power produces a multiplied photocurrent of $10 \mu\text{A}$. What is the multiplication M ?
- A) 42 B) 43
C) 44 D) 45

76. Identify the signal assignment statement, in behavioral VHDL modeling, to perform the task "a gets the value of b when 10 nanoseconds have elapsed".

- A) `a <= b after 10 ns;` B) `a <= b before 10 ns;`
C) `a <= b elapsed 10 ns;` D) `a <= b get 10 ns;`

77. A simple IF statement using VHDL is given.

```
IF(x < 10)
```

```
  a=b;
```

```
END IF;
```

The errors in the statement/program is/are,

1. 'THEN' keyword is missing in 'IF (x<10)'
2. ':' is missing in 'a = b'
3. 'ELSE' is missing 'IF (x<10)'
4. Colon ':' is missing in 'IF (x<10)'

- A) 3 only B) 2 and 3 only
C) 1 and 2 only D) 1, 2 and 3

78. Consider the following statements:

Assertion (A): FPGA devices use onboard RAM to store the value of programmable switches.

Reason (R): The switches are used to form the signal interconnections.

The correct answer is

- A) A and R are both correct and R is the correct explanation of A
B) A and R are both correct and R is NOT the correct explanation of A
C) A is correct, but R is NOT correct
D) A is NOT correct, but R is correct

79. The objects that are used to connect entities to form models in VHDL

- A) Variables B) Constants
C) Signals D) Integers

80. Find the correct match.

- a) CPLD - 1. EEPROM
- b) GAL - 2. Logic cell
- c) FPGA - 3. Macrocell

The correct match is,

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

81. Consider the following statements:

Assertion (A): The AND plane consists of a programmable interconnect along with AND gates.

Reason (R): The OR plane consists of a programmable interconnect along with OR gates.

The correct answer is

- A) A and R are both correct and R is the correct explanation of A
- B) A and R are both correct and R is NOT the correct explanation of A
- C) A is correct, but R is NOT correct
- D) A is NOT correct, but R is correct

82. Identify the causal systems from the given list.

- 1. $y(n) = ax(n)$
 - 2. $y(n) = nx(n)$
 - 3. $y(n) = x(2n)$
 - 4. $y(n) = x(-n)$
- A) 3 and 4 only
 - B) 2 and 3 only
 - C) 1 and 2 only
 - D) 1 and 3 only

83. If an energy signal is finite, then the average power of the signal is,

- A) One
- B) Zero
- C) Finite
- D) Infinite

84. Find the IDFT of $Y(k) = \{1, 0, 1, 0\}$.

A) $y(n) = \{0.5, 0, 0, 0\}$

B) $y(n) = \{0, 0, 0.5, 0\}$

C) $y(n) = \{0.5, 0, 0.5, 0\}$

D) $y(n) = \{0, 0, 0.5, 0.5\}$

85. Consider the following statements:

Assertion (A): In FIR filter design, a triangular window is not a good choice.

Reason (R): In FIR filters designed using a triangular window, the transition from pass band to stop band is not sharp.

The correct answer is

A) A and R are both correct and R is the correct explanation of A

B) A and R are both correct and R is NOT the correct explanation of A

C) A is correct, but R is NOT correct

D) A is NOT correct, but R is correct

86. Which is not a design technique for designing the linear phase FIR filters?

A) Fourier series method

B) Window method

C) Bilinear transformation method

D) Frequency sampling method

87. Consider the following statements:

Assertion (A): The Fourier transform of a discrete-time signal is a continuous function of ' ω ' and hence it is not processed by a digital system.

Reason (R): The drawback of the Fourier transform is overcome by using a discrete Fourier transform.

The correct answer is

A) A and R are both correct and R is the correct explanation of A

B) A and R are both correct and R is NOT the correct explanation of A

C) A is correct, but R is NOT correct

D) A is NOT correct, but R is correct

88. Identify the multiple access schemes that can be accommodated by cellular technology-based networks from the given list.

1. FDMA

2. TDMA

3. SDMA

4. MDMA

A) 2, 3 and 4 only

B) 2 and 3 only

C) 1 and 2 only

D) 1, 2 and 3 only

ROUGH WORK

ROUGH WORK

SEAL

11(A)

(24)