B2.4-R4: DATA COMMUNICATION & NETWORK TECHNOLOGIES

अवधि: 03 घंटे **अधिकतम अंक: 100**

DURATION: 03 Hours **MAXIMUM MARKS: 100**

ओएमआर शीट सं.: **OMR Sheet No.:**						

रोल नं.: **Roll No.:** | | | | | | |

उत्तर-पुस्तिका सं.: **Answer Sheet No.:** | | | | | | |

परीक्षार्थी का नाम: **परीक्षार्थी के हस्ताक्षर:**

Name of Candidate: _____; Signature of candidate: _____

परीक्षार्थियों के लिए निर्देश:	**Instructions for Candidates:**
कृपया प्रश्न-पुस्तिका, ओएमआर शीट एवं उत्तर–पुस्तिका में दिये गए निर्देशों को ध्यानपूर्वक पढ़ें।	Carefully read the instructions given on Question Paper, OMR Sheet and Answer Sheet.
प्रश्न-पुस्तिका की भाषा अंग्रेजी है । परीक्षार्थी केवल अंग्रेजी भाषा में ही उत्तर दे सकता है ।	Question Paper is in English language. Candidate can answer in English language only.
इस मॉड्यूल/पेपर के **दो भाग** हैं। **भाग एक** में चार प्रश्न और **भाग दो** में पाँच प्रश्न हैं ।	There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions**.**
भाग एक "वैकल्पिक" प्रकार का है जिसके कुल अंक 40 है **तथा भाग दो**, "व्यक्तिपरक" प्रकार है और इसके कुल अंक 60 हैं।	**PART ONE** is Objective type and carries 40 Marks. **PART TWO** is subjective type and carries 60 Marks.
भाग एक के उत्तर, इस प्रश्न-पत्र के साथ दी गई **ओएमआर उत्तर-पुस्तिका** पर, उसमें दिये गए अनुदेशों के अनुसार ही दिये जाने हैं। **भाग दो** की उत्तर-पुस्तिका में **भाग एक** के उत्तर **नहीं** दिये जाने चाहिए।	**PART ONE** is to be answered in the **OMR ANSWER SHEET** only, supplied with the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book for **PART TWO**.
भाग एक के लिए अधिकतम समय सीमा **एक घण्टा** निर्धारित की गई है। **भाग दो** की उत्तर-पुस्तिका, **भाग एक** की उत्तर-पुस्तिका जमा कराने के पश्चात दी जाएगी। तथापि, निर्धारित एक घंटे से पहले **भाग एक** पूरा करने वाले परीक्षार्थी **भाग एक** की उत्तर-पुस्तिका निरीक्षक को सौंपने के तुरंत बाद, **भाग दो** की उत्तर-पुस्तिका ले सकते हैं।	Maximum time allotted for **PART ONE** is **ONE HOUR.** Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE.**
परीक्षार्थी, उपस्थिति-पत्रिका पर हस्ताक्षर किए बिना और अपनी उत्तर-पुस्तिका, निरीक्षक को सौंपे बिना, परीक्षा हॉल/कमरा नहीं छोड़ सकते हैं। ऐसा नहीं करने पर, परीक्षार्थी को इस मॉड्यूल / पेपर में अयोग्य घोषित कर दिया जाएगा।	**Candidate cannot leave the examination hall/room without signing on the attendance sheet or handing over his Answer sheet to the invigilator. Failing in doing so, will amount to disqualification of Candidate in this Module/Paper.**
प्रश्न-पुस्तिका को खोलने के निर्देश मिलने के पश्चात एवं उत्तर देने से पहले उम्मीदवार यह जाँच कर सुनिश्चित कर लें कि प्रश्न-पुस्तिका प्रत्येक दृष्टि से संपूर्ण है।	After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question booklet is complete in all respect.

जब तक आपसे कहा न जाए, तब तक प्रश्न-पुस्तिका न खोलें।

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

SPACE FOR ROUGH WORK

PART ONE

(Answer all the questions.)

1. Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the "OMR" answer sheet supplied with the question paper, following instructions therein. **(1 × 10)**

1.1 Which of the following layer deals with the mechanical and electrical specifications of the interface and transmission medium ?

(A) Transport (B) Network
(C) Data Link (D) Physical

1.2 Which of the following is a mechanism used by hosts and gateways to send notification of datagram problems back to the sender ?

(A) The Internet Group Management Protocol (IGMP)
(B) The Internet Control Message Protocol (ICMP)
(C) The Address Resolution Protocol (ARP)
(D) The Reverse Address Resolution Protocol (RARP)

1.3 A signal is carrying data in which one data element is encoded as one signal element (r = 1). If the bit rate is 100 kbps, what is the average value of the baud rate if c is between 0 and 1 ?

(A) 25 (B) 50
(C) 75 (D) 100

1.4 In which of the following, very high-frequency signals are transmitted in straight lines directly from antenna to antenna?

(A) Ground Propagation
(B) Sky Propagation
(C) line-of-sight propagation
(D) None of the above

1.5 Which of the following is an abstract concept that defines the range of sequence numbers that is the concern of the sender and receiver ?

(A) Error control
(B) Error detection
(C) The sliding window
(D) Acknowledgement

1.6 Which of the following is a three-way hand-shaking authentication protocol that provides greater security than PAP ?

(A) The Link Control Protocol (LCP)
(B) The Challenge Handshake Authentication Protocol (CHAP)
(C) The Point-to-Point Protocol (PPP)
(D) The High-level Data Link Control (HDLC)

1.7 Which of the following method after the station finds the line idle, it sends its frame immediately ?

(A) 1-persistent
(B) Non-persistent
(C) p-persistent
(D) None of the above

1.8 Which of the following uses one link between the station and the switch, the configuration uses two links: one to transmit and one to receive ?

(A) Full-Duplex Ethernet

(B) Switched Ethernet

(C) Bridged Ethernet

(D) None of the above

1.9 Which of the following device works at physical layer ?

(A) Router (B) Switch

(C) Hub (D) Repeater

1.10 Which of the following is not a part of data link layer in SONET ?

(A) Photonic layer

(B) Path layer

(C) Line layer

(D) Selection layer

2. Each statement below is either TRUE or FALSE. Choose the most appropriate one and enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein. (1×10)

2.1 An open system is a set of protocols that allows any two different systems to communicate regardless of their underlying architecture.

2.2 The Stream Control Transmission Protocol (SCTP) does not provide support for newer applications such as voice over the Internet.

2.3 A periodic composite signal can be decomposed into a series of simple sine waves with discrete frequencies.

2.4 Line coding is the process of converting digital data to analog signals.

2.5 The isochronous transmission guarantees that the data arrive at a dynamic rate.

2.6 Coaxial cable (or coax) carries signals of higher frequency ranges than those in twisted-pair cable, in part because the two media are constructed quite differently.

2.7 Electromagnetic waves ranging in frequencies between 3 kHz and 1 GHz are normally called microwaves; waves ranging in frequencies between 1 and 300 GHz are called radio waves.

2.8 In a packet-switched network, there is no resource reservation; resources are allocated on demand.

2.9 A burst error means that 2 or more bits in the data unit have changed.

2.10 The Ethernet frame contains five fields: preamble, SFD, DA, SA, length or type of protocol data unit (PDU).

3. Match words and phrases in column X with the closest related meaning/ word(s)/phrase(s) in column Y. Enter your selection in the "OMR" answer sheet supplied with the question paper, following instructions therein. (1 × 10)

X		Y	
3.1	Keyboards and traditional monitors are examples of	A	Automatic Repeat Request (ARQ).
3.2	The session layer is the network	B	compounding
3.3	To show the relationship between amplitude and frequency, we can use what is called	C	Interference
3.4	A common bipolar encoding scheme is called bipolar	D	hamming distance
3.5	Nonuniform quantization can also be achieved by using a process called	E	decoding
3.6	The idea of using two carriers, one in-phase and the other quadrature, with different amplitude levels for each carrier is the concept behind	F	a frequency-domain plot.
3.7	In circuit switching resources, such as channels, switch buffers, switch processing time, and switch input/output ports, must remain dedicated during the entire duration of data transfer until	G	connectionless networks.
3.8	The datagram networks are sometimes referred to as	H	the teardown phase.
3.9	Whenever bits flow from one point to another, they are subject to unpredictable changes because of	I	alternate mark inversion (AMI).
3.10	Any time an error is detected in an exchange, specified frames are retransmitted. This process is called	J	simplex devices.
		K	sine wave
		L	Quadrature Amplitude Modulation (QAM).
		M	dialog controller.

4. Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Choose the most appropriate option, enter your choice in the "OMR" answer sheet supplied with the question paper, following instructions therein. (1 × 10)

A.	Datagrams	B.	piggybacking	C.	ALOHA
D.	Data link layer	E.	fixed-size framing	F.	Internet Control Message Protocol
G.	UDP	H.	Transit time	I.	buffer
J.	Gateway	K.	unidirectional antennas	L.	NRZ-I
M.	token-passing				

4.1 _____ is the amount of time required for a message to travel from one device to another.

4.2 _____ can travel along different routes and can arrive out of sequence or be duplicated.

4.3 In _____ the inversion or the lack of inversion determines the value of the bit.

4.4 Microwaves need _____ that send out signals in one direction.

4.5 The central concept in detecting or correcting errors is _____.

4.6 In _____, there is no need for defining the boundaries of the frames; the size itself can be used as a delimiter.

4.7 Each receiving device has a block of memory, called a(n) _____, reserved for storing incoming data until they are processed.

4.8 A technique called _____ is used to improve the efficiency of the bidirectional protocols.

4.9 The random access methods have evolved from a very interesting protocol known as _____, which used a very simple procedure called multiple access (MA).

4.10 In the _____ method, the stations in a network are organized in a logical ring.

PART TWO

(Answer any FOUR Questions.)

5. (a) Explain the policies related to Open-Loop Congestion Control.

(b) What is loop to infinity in routing ? How it can be solved ?

(c) Explain TCP Three-Way Handshaking. What is half close connection ? **(5+6+4)**

6. (a) What is router ? What is Address Aggregation ?

(b) A pure ALOHA network transmits 200-bit frames on a shared channel of 200 kbps. What is the throughput if the system (all stations together) produces ?

(i) 1000 frames per second

(ii) 500 frames per second

(iii) 250 frames per second

(c) Write the Advantages and disadvantages of Fiber-optic cable over metallic cable (twisted-pair or coaxial). **(3+6+6)**

7. (a) Explain four fundamental characteristics which are essential for effective data communication system.

(b) Which are the services provided by Point-to-point protocol ? Also List services which are not provided by it.

(c) Explain the responsibilities of the data link layer. **(4+6+5)**

8. (a) Write down the advantages and disadvantages of bus topology.

(b) Explain three popular controlled-access methods.

(c) Discuss the fields of High-level Data Link Control (HDLC) and their use in different frame types. **(4+6+5)**

9. (a) Explain the fields of frame relay frame.

(b) Assume that a voice channel occupies a bandwidth of 4 kHz. We need to combine three voice channels into a link with a bandwidth of 12 kHz, from 20 to 32 kHz. Show the configuration, using the frequency domain. Assume there are no guard bands.

(c) What are classful and classless addresses ? Find the class of each of the following IP address :

(i) 00000001 00001011 00001011 11101111

(ii) 11000001 10000011 00011011 11111111

(iii) 14.23.120.8

(iv) 252.5.15.111 **(6+4+5)**

SPACE FOR ROUGH WORK