

Data Communication and Networking – May 2005

Time : 3 Hrs.]

[Marks : 100

- N.B. :**
- (1) Question No. 1 is **compulsory**.
 - (2) Answer any **five** questions including the **compulsory** question.
 - (3) Assume **suitable** data wherever **required**, stating them **clearly**.

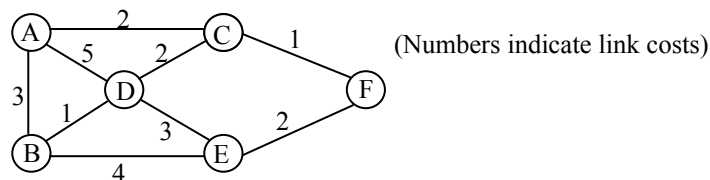
1. (a) List the categories of UTP cables. How is noise interference minimised in twisted pair ? [20]
 (b) What is Delay distortion with respect to a transmission medium ? How can it be corrected ?
 (c) List the functions of the transport layer. Define each function in one line.
 (d) In flooding technique what are the methods employed to check the number of packets in circulation ?
 (e) Explain the VCI/VPI structure used in ATM. State advantages.

2. (a) Draw the block diagram of a TDM-PCM System that will accommodate eight -7200 bps [8]
 synchronous digital inputs and three analog inputs with bandwidths of 2kHz, 4kHz and
 2kHz respectively. Assume that the analog inputs will be encoded into 4-bit PCM words.
 What is the required capacity for the TDM link ? Sketch the TDM frame – format.
 (b) Explain ADSL with respect to the following [6]
 (i) Channel configuration (ii) Modulation Technique.
 (c) Derive the expression for efficiency of Line utilization for selective – Reject ARQ. [6]

3. (a) Calculate the maximum link utilization on a 1Mbps Satellite Channel with 270 ms round-trip [6]
 propagation delay and frame size of 1000 bits in the following cases.
 (i) Stop and wait flow control
 (ii) Continuous flow control with window sizes of 7, 127 and 255.
 (b) For the following block of 16 bits is :- [6]
 10101001 00111001
 (i) Obtain checksum of 8 bits.
 (ii) If there is no error in reception, shown that the receiver detects the same.
 (iii) For the received data 10101111 11111001 00011101, obtain the receiver decision.
 (c) A is the primary station connected to the two secondary stations B and C in a half-duplex data [8]
 transfer mode. Sketch the sequence of HDLC frames issued to implement the data transfer for the
 following events.
 (i) A sends a command to set up the NRM mode to B and C stations.
 (ii) The secondary stations B and C respond positively.
 (iii) A selects station C for initiating data transfer.
 (iv) C responds positively.
 (v) A sends frames 0, 1, 2, 3 to C and C acknowledges all the frames except 3.
 (vi) Station C sends positive acknowledgement for frame 3.
 (vii) A sends the command to disconnect the data transfer mode and C acknowledges it properly.

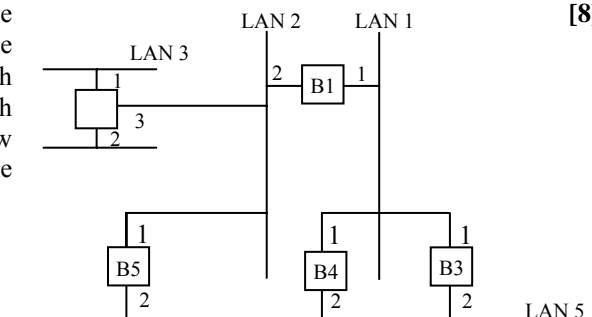
4. (a) With a suitable sketch ; explain the connection phases in Point - to - Point Protocol (PPP). State the [8]
 main features of the Authentication Protocols supported by PPP.
 (b) Sketch non – blocking switches with $N = 32$ and group size $n = 4$ for the following: [8]
 (i) 3 – stage space division switch (ii) TST switch
 Which the better option ? Why ?
 (c) Briefly explain the signalling structure supported by SS7. [4]

5. (a) State Dijkstra's Algorithm. [10]
 Apply the above algorithm to the network shown below for source node A. From the result, develop
 the routing table for node A.



- (b) Distinguish between implicit congestion Signalling and Explicit Congestion Signalling. [5]
- (c) Compare merits and demerits of datagram Switching and Virtual Circuit Switching. [5]

6. (a) Explain Spanning Tree Algorithm. Consider the [8]
 topology of a bridged LAN as shown below : The
 bridges are designed by B1, B2, ——— and each
 ports ID is indicated. The cost assigned to each
 LAN is equal. Choose B1 as the root bridge. Show
 the forwarding and blocking port after applying the
 Spanning Tree procedure.



- (b) Explain LAN protocol architecture with IEEE 802 reference. Sketch the general MAC Frame format and the LLC PDC structure. Explain the function of the different fields. [6]
- (c) Distinguish between the following token insertion strategies. [6]
 - (i) Single token operation (ii) Multi-token operation (iii) Single frame operation
- 7. (a) In ATM architecture, explain how the function of the AAL (ATM Adaptation layer) are handled by its different sub layers. [6]
- (b) Sketch the frame format for LAPF and explain the merits of with respect to X – 25 [6]
- (c) Explain the ISDN Channel Structure for [8]
 - (i) Basic Service (ii) Primary Service.

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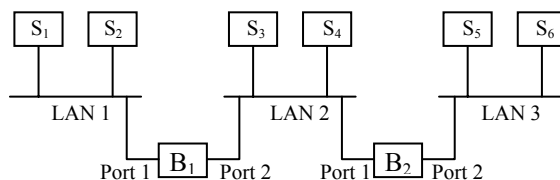
- 1. (a) Coaxial cable is much less susceptible to interference and cross talk than twisted pair. Why ? [4]
- (b) What causes intermodulation noise in a communication link ? [4]
- (c) List the functions of the Network layer in the OST model. [4]
- (d) Distinguish between datagram switching and virtual circuit switching. [4]
- (e) Explain the Network structure of SS7. [4]
- 2. (a) Distinguish between synchronous TDM and statistical TDM. Explain merits and demerits of statistical TDM with respect to synchronous TDM. [8]
- (b) Explain channel associated signalling with respect to DS-1 (T1) transmission format. [8]
- (c) What is the advantage of DSL technology ? [4]
- 3. (a) A CRC is constructed using the divisor 10011 (LSB). [10]
 - (i) Encode the data bit sequence 1001001011 (LSB).
 - (ii) Draw the shift register circuit for the encoder.
 - (iii) What are the conditions to be satisfied for a valid generator polynomial ?
- (b) List the electrical specifications of EIA – 232. [4]
- (c) Calculate the maximum link utilisation of the network specified below for the following cases. [6]
 - (i) Stop and wait flow control.
 - (ii) Sliding window flow control with window sizes of 4 and 7.

Link specifications :

Frame length	= 1000 bits/frame	Link distance	= 20 km.
Velocity of propagation	= 2×10^8 m/sec.	Data rate	= 20 Mbps
- 4. (a) Compare Go-back N, ARQ and selective – reject ARQ. What is the maximum window size in both cases ? [5]
- (b) Sketch HDLC frame structure. With respect to it, explain : [10]
 - (i) Piggybacking
 - (ii) Bit – stuffing
 - (iii) Types of frames in HDLC
- (c) Explain the principle of TDM sub-switching with a suitable sketch : On a 2 Mbps bus, how many full-duplex connections can be enabled at any time with each device operating at 8 Kbps ? [5]
- 5. (a) List the different channel signalling techniques in circuit-switching. What are the advantages of common channel signalling ? [6]
- (b) List the different routing techniques employed in packet switching. State advantages and drawbacks of adaptive routing. [6]
- (c) Why is congestion control required ? List the congestion control techniques used in [8]
 - (i) Packet switching (ii) Frame relay
- 6. (a) Compare the IEEE 802 Protocol layers with the OSI model. [6]
- (b) Explain the 'Address Learning' mechanism with respect to Bridge Routing. [10]

Stations (S₁ – S₆) are connected to an extended LAN through bridges B₁ and B₂ as shown in figure. Initially, the forwarding tables are empty. Suppose the following stations transmit frames :

- S₂ transmits to S₁
- S₅ transmits to S₄
- S₃ transmits to S₅
- S₁ transmits to S₂
- S₆ transmits to S₅



Fill the forwarding tables of B₁ and B₂ with appropriate entries after the frames have been completely transmitted.

- (c) What is non-persistent CSMA ? [4]

7. (a) With a suitable sketch, explain ATM cell format for user-network interface. [8]
 (b) List the merits and drawbacks of Frame Relay with respect to X.25. [6]
 (c) With a suitable sketch, explain ISDN Architecture. [6]

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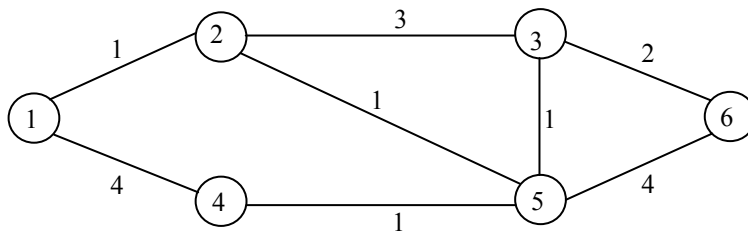
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1. (a) Why ADSL unsuitable for business ? Which DSL technology is best suited for business? Explain. [20]
 (b) How do the layers of TCP / IP Protocol Suite correlate to the layers of the OSI model ?
 (c) What are the three sets of Protocol which makes PPP G Powerful Protocol ? Explain.
 (d) Sketch HDLC frame structure and explain the importance of “P/F” bit.
 (e) Compare packet switching frame relay and ATM.
2. (a) What is the difference between a Port address, a Logical address, and a Physical address? [8]
 Name some services provided by the application layer in the Internet Model.
 (b) Why is coaxial cable superior to twisted pair cable ? [4]
 (c) Explain pulse stuffing in Time Division Multiplexing. A signal $m_1(t)$ is bandlimited to 3KHz. There are three more signals $m_2(t)$, $m_3(t)$ and $m_4(t)$ which are bandlimited to 1KHz each. These signals are to be transmitted by a TDM system. [8]
 (i) Design a TDM scheme where each signal is sampled at its Nyquist rate.
 (ii) What must be the speed of the commutator ?
 (iii) Calculate the minimum transmission bandwidth of the channel.
3. (a) What are the three frame types supported by HDLC ? Describe each. [6]
 (b) What is the advantage of sliding window flow control compared to stop and wait flow control ? [8]
 Consider the stop and wait protocol operating on a 1Gbps link with 128 byte packet and 32 byte acknowledgements. The distance between the transmitter and receiver is 100km and the signal propagation delay is 5μ sec/km. What is the efficiency of the protocol ?
 (c) What are the conditions to be satisfied for a valid CRC generator polynomial ? List the steps involved in creating a Internet checksum. [6]
4. (a) Explain SS7 Architecture. How a basic call setup in SS7 ? [8]
 (b) What is blocking in circuit switched network ? Derive the condition for non blocking. [6]
 (c) Explain flooding Technique in packet-switched networks. How can the number of packets in circulation be regulated ? When can this technique be used ? [6]
5. (a) Differentiate between Link State Routing and Distance Rector Routing. [4]
 (b) Apply Dijkstra’s and Bellman - Ford routing algorithm to the network shown below for source node 1. From the result, develop the tree and routing table for node 1. Will Dijkstra’s algorithm and the Bellman-Ford algorithm always yield the same solution ? Why or why not ? [10]



- (c) What is congestion in a packet switching network? How to achieve quality of service? [6]
6. (a) Explain in detail ATM logical connection. How a call established using virtual path in ATM atmosphere ? [6]
 (b) List all the physical specification defined by IEEE Project 802.3. How does fast Ethernet differ from 10BASE-T ? [8]
 (c) With respect to MAC Protocol explain : [6]
 (i) Token Ring
 (ii) FDDI.
7. (a) Draw the block diagram of ISDN and explain : [10]
 (i) ISDN channel (ii) Interface (iii) Reference Point (iv) B-ISDN
 (b) Explain the looping problem in bridge LAN. How to solve the looping problem ? [5]
 (c) Write notes on Flow Control methods in data link layer. [5]

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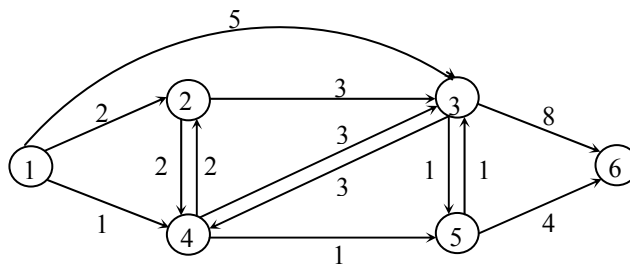
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 (3) Assume **suitable** data if **required**.

1. Answer the following question (any four) : [20]
 - (a) What are transmission impairments? Explain each briefly.
 - (b) How do the layers of the Internet model correlate to the layers of the OSI model ?
 - (c) Discuss any two technologies that have higher data rate than traditional modems.
 - (d) Compare the format of an HDLC protocol frame with a frame relay protocol frame. Why is the control field from HDLC totally dropped from Frame Relay?
 - (e) A Message is brokenup into three Pieces. Discuss the transmission of the packets using the datagram approach to packet switching.

2. (a) Is bit padding a technique for FDM or TDM? Is the freaming bit used in FDM or TDM? Explain. [8]
 (b) What is the form of the signal in twisted-pair cable and Coaxial Cable? [6]
 (c) Design an STS Switch with 10 inputs and 10 outputs. The first stage switches should be 5×2 , and the last – stage switches should be 2×5 . [6]

3. (a) Why is flow control needed? How does Go-Back-N ARQ differ from Selective Repeat ARQ? [6]
 (b) A CRC is constructed using the divisor 10011 (LSB). [6]
 - (i) Encode the data bit sequence 1001001011 (LSB).
 - (ii) Draw the shift register circuit for the encoder.
- (c) Sketch the HDLC frame structure with respect to it. Explain – [8]
 - (i) Piggybacking
 - (ii) Types of frames in HDLC
4. (a) What is the fundamental difference between circuit switching and Packet Switching? Write the two popular approaches to Packet Switching. [8]
 (b) What is the difference between unicast routing and multicast routing? What is the role of the Di jkstra algorithm in unicast routing? [8]
 (c) How are congestion control and quality of service related? [4]

5. (a) Apply Dijkstras and Bellman-Ford Algorithm to the given graph and find out the minimum distances between source node 1 to all other nodes. [12]

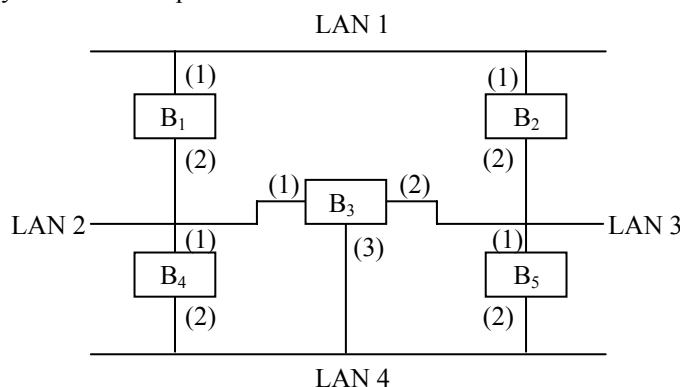


Compare the result.

- (b) How are congestion control and quality of service related? What are four general techniques to improve quality of service? [8]

6. (a) With the help of neat diagram explain – [8]
 - (i) ATM Adaptation Layer
 - (ii) ATM Logical Connections.
- (b) Explain how frame relay provides Congestion Control and quality of Service. [6]

- (c) Apply the spanning Tree Algorithm on the following bridged LAN, and find out the resulting spanning tree Configuration. The bridges are identified By B_1, B_2, \dots, B_5 , and each Port ID is identified by the number in parentheses. [6]



7. (a) Explain the following : [8]
 (i) ISDN Channel (ii) ISDN Reference Point.
 (b) Write the short notes on the following (any three) : [12]
 (i) SS7 (ii) IEEE 802.3 MAC (iii) FDDI (iv) DTE – DCE interface.

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 (3) Assume **suitable** data if **necessary**.

1. (a) Compare the following transmission media : [10]
 (i) Twisted pair and optical fiber
 (ii) STP and co-axial cable.
 (b) (i) Discuss difference between repeaters, bridge, routers and gateway. [10]
 (ii) Explain in brief design factors for transmission media.
2. (a) Compare – [10]
 (i) HDSL (ii) ADSL (iii) SDSL (iv) VDSL
 (b) What is protocol performance ? Derive the relation for protocol performance for [10]
 (i) stop and wait flow control mechanism.
 (ii) sliding-window-protocol mechanism.
3. (a) Explain Leaky bucket and Token bucket algorithm in detail. [10]
 (b) Explain – [10]
 (i) Dijkstra's (ii) Belman-Ford Algorithm.
4. (a) Explain signalling system 7 (ss7) in detail. [10]
 (b) Write note on – [10]
 (i) IEEE 802.3 (ii) IEEE 802.5
5. (a) Draw and explain ATM reference model. [8]
 (b) Generate the CRC code for message 1101010101 given generate polynomial [8]
 $g(x) = x^4 + x^2 + 1$
 (c) What is DTE - DCE interface ? [4]
6. (a) Explain SLIP and PPP protocol used in internet. [10]
 (b) Explain HDLC in detail. [10]
7. Write short on: [20]
 (a) CSMA/CA (b) ISDN
 (c) TCP/IP reference model (d) Spanning Tree algorithm

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 (3) Assume any **suitable** data wherever **required** but justify the **same**.

1. Answer any **four** questions : [20]
 (a) Coaxial cable is much less susceptible to Interference and cross talk than twisted pair. Why ?
 (b) What are the conditions to be satisfied for a valid. CRC generator polynomial ? List the steps involved it.
 (c) Define utilization efficiency of the line and obtain the expression for the same for sliding window flow control.
 (d) Explain the looping problem in bridge LAN. How to solve it ?
 (e) Distinguish between frame relay and ATM.
2. (a) Explain XDSL Technologies and its application with the help of block diagram. Explain in detail ADSL. [10]
 (b) Two neighbouring nodes A and B use Go-Back N ARQ with a 3 bit sequence number. Assuming that [10]
 A is transmitting and B is receiving. Show the window position and frame flow for the following sequence of events :
 (i) Initial Position, Before A sends any Frames window at A & B.
 (ii) After A sends frames 0,1,2 and B acknowledge 0,1 and the ACK are received by A.
 (iii) A sends frames 3,4 and then receiver REJ 3 from B.
 (iv) A sends frames 3,4,5,6. The acknowledgement RR7 send by B is lost and A does not receive it. How would A react ? Indicate in the frame flow diagram.

3. (a) Explain HDLC Protocol with respect" to the following : [10]
 - (i) Data Transfer mode (ii) Frame structure .and type
- (b) Draw a Three-stage space - division switch for $N = 20$, $N = 5$ and $K = 2$ and estimate the no. of crosspoint required, if the above switch is to be made non-blocking, derive the expression for the condition to be satisfied, also calculate the minimum crosspoint required for non-blocking. [10]
4. (a) Explain with the help of neat sketch the Frame format of frame relay also give the detail of following Protocol [10]
 - (i) FECN (ii) BECN (iii) EA (iv) DE
- (b) State and Explain the following : [10]
 - (i) Dijkstra's Routing Algorithm
 - (ii) Bellman—Ford Routing Algorithm
5. (a) Justify, Ethernet is connection oriented or connection less. What is the purpose of the IEEE 802 Committee ? Explain CSMA / CD and its use. [10]
- (b) Distinguish between :
 - (i) Synchronous TDM with satisfied TDM [3]
 - (ii) Inband signaling and out of band signaling [4]
 - (iii) TCP and UDP [3]
6. (a) Explain ATM adaptation Layer and ATM cell in detail. [10]
- (b) Explain the following : [10]
 - (i) ISDN Channels and Architecture (ii) ISDN user interfaces.
7. Write short notes on the following (any four) : [20]
 - (a) Point to Point Protocol
 - (b) FDDI
 - (c) Signaling System Seven (SS7)
 - (d) TCP/IP
 - (e) Congestion Control and Quality of Service



Data Communication and Networking – May 2008

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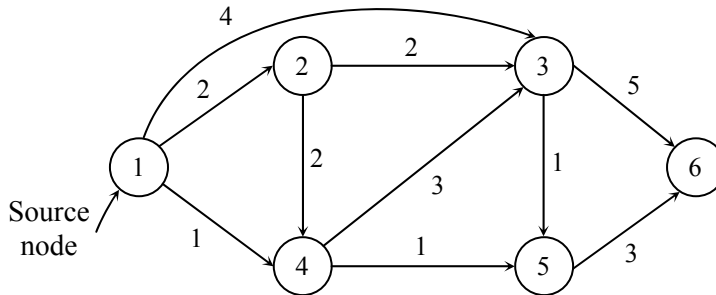
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 - (2) Attempt any **four** questions out of the remaining **six** questions.
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1. Attempt any four questions : [20]
 - (a) What are the transmission impairments? Explain each briefly.
 - (b) What are the three types of frames supported by HDLC? Describe each in detail.
 - (c) Distinguish between circuit switching and Packet switching.
 - (d) What are the advantages of statistical TDM over synchronous TDM?
 - (e) What are the functions of Data Link Layer in the OSI Model.
2. (a) Draw the block diagram of a TDM-PCM system that will accommodate four 14.4 kbps synchronous digital inputs and two analog inputs with bandwidth 4 KHz each. Assume that the analog inputs will be encoded into 4 bit PCM words. What is the required capacity for the TDM Link? [10]
- (b) Explain the pulse stuffing in TDM. [5]
- (c) What is ADSL technology? Explain in detail. [5]
3. (a) A CRC is constructed using the CRC–16 polynomial. Determine the CRC if data bit sequence is 1010101010101. Also draw the shift register circuit for the same. [10]
- (b) Calculate the maximum link utilisation of the network specified below for the following cases: [6]
 - (i) Stop-and-Wait flow control
 - (ii) Sliding window flow control with window sizes of 7 and 15.

Link specifications :	Frame length	=	1200 bits
	Velocity of propagation	=	2×10^8 m/sec.
	Link distance	=	16 km
	Data rate	=	20 mbps.
- (c) Compare Stop-and-wait flow control with sliding window flow control. [4]
4. (a) Draw HDLC frame format. Explain each frame in detail. Also explain : [10]
 - (i) Data Transparency
 - (ii) Data transfer modes in HDLC.
- (b) Compare Go-back-N ARQ and selective repeat ARQ. [5]
- (c) Explain architecture of SS7. [5]

5. (a) Apply Dijkstra's and Bellman Ford Algorithm to the given network and find the least cost path [10] between the source node 1 to all other nodes :



- (b) Explain different routing techniques used in packet switched networks. [10]
6. (a) Explain in detail : (i) ATM adoption layer (ii) ATM logical connections. [5]
 (b) Explain in detail : (i) ISDN channels (ii) ISDN user interfaces. [5]
 (c) List the advantages of frame relay with respect to X-25. [10]
7. Write a short notes on (any **four**) : [20]
 (a) Channel signaling techniques in circuit switching
 (b) Token Ring
 (c) FDDI
 (d) Congestion control techniques
 (e) Spanning Tree Algorithm.

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1. Answer any **four** questions : [20]
 (a) Does TCP provide connection oriented or connection less service ? Differentiate between TCP and UDP.
 (b) What is TDM bus-switching ? Explain the working of the control unit of a TDM bus-switch with suitable diagram.
 (c) Why packet switching preferred over circuit switching for data transmission ?
 (d) How does fast Ethernet differ from 10 BASE – T?
 (e) Explain the ISDN channel structure for basic and primary services.
2. (a) What are transmission impairments ? Compare any two transmission media with reference to their physical structure/characteristics, applications and performance. [10]
 (b) Calculate link utilization, efficiency if the bit rate is 19.2 kbps, frame size is 960 bits, propagation time is 0.06 second for – [10]
 (i) Window Size = 3
 (ii) Window Size = 7
 (iii) What is minimum window size for 100% link utilization ?
3. (a) Explain different type of ARQ techniques and compare their merits and demerits. [10]
 (b) What is the advantages of the common channel signaling in a circuit switched network ? Distinguish between the associated mode and non-associated mode of operation. [10]
4. (a) Distinguish between : [10]
 (i) Circuit switching, datagram and virtual circuit switching
 (ii) Distance vector and link state routing.
 (b) With a suitable sketch explain the connection phases in point to point protocol (PPP), also explain supported sets of protocols to make a PPP a powerful protocol. [10]
5. (a) Explain the signaling structure supported by SS7. How a basic call setup in SS7? [10]
 (b) Sketch the frame format of frame relay and explain address field. How it provides congestion control and quality of service ? [10]
6. (a) Create a system of 3 LANs with 4 bridges. The bridge (B₁ to B₄) connect the LANs as follows : [10]
 (i) B₁ connects LAN 1 and LAN 2
 (ii) B₂ connects LAN 1 and LAN 3
 (iii) B₃ connects LAN 2 and LAN 3
 (iv) B₄ connects LAN 1, LAN 2 and LAN 3.
 (b) Explain LAN protocol architecture with IEEE 802 reference. Sketch the general MAC frame format and the LLC PDU structure. [10]

7. (a) Draw block diagram of functional architecture of B-ISDN and explain B-ISDN Channels and Interface. [10]
 (b) Write short notes on the following (**any two**) : [10]
 (i) XDSL
 (ii) Dijkstra's Routing Algorithm
 (iii) CSMA/CD.

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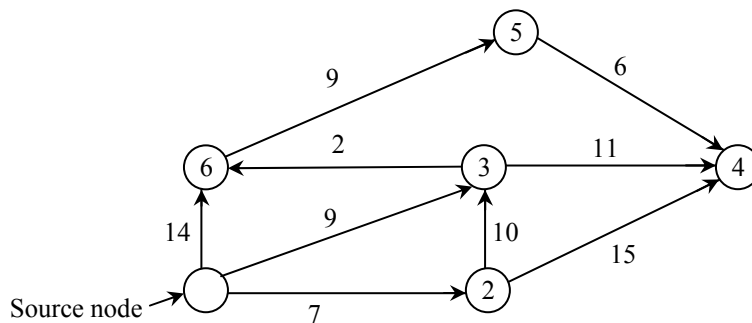
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1. Answer any four questions: [20]
 (a) What are the transmission impairments? Explain each briefly.
 (b) Compare Go-back-N ARQ and selective repeat ARQ.
 (c) What are the advantages of statistical TDM over synchronous TDM?
 (d) Discuss difference between repeaters, bridges, routers and gateway.
 (e) A message is broken up into three packets. Discuss the transmission of the packets using virtual circuit approach to packet switching.
2. (a) Draw the layered OSI network architecture. Explain the function of each layer and show the path of actual and virtual communication between the layers. [10]
 (b) Explain with neat diagrams how U-frames can be used for connection establishment and connection release between two neighbouring nodes A and B. Also explain exchange of information between the same nodes using piggybacking without and with error. [10]
3. (a) With a suitable sketch explain the connection phases in point to point protocol, also explain supported sets of protocols to make a ppp a powerful protocol. [10]
 (b) What are the conditions to be satisfied by a good CRC generator polynomial? [10]
 For P = Predetermined divisor = 110101 (LSB) and
 D = K-bit block of data = 1010001101 (LSB)
 Find the CRC.
4. (a) Explain X DSL technologies and its applications. Explain in detail ADSL. [10]
 (b) Draw a three-stage space-division switch for N = 20, n = 5 and k =2 and estimate the number of crosspoints required. If the above switch is to be made non-blocking, derive the expression for the condition to be satisfied, also calculate the minimum crosspoint required for non-blocking. [10]
5. (a) Calculate the maximum link utilization of the network specified below for the following cases. [6]
 (i) stop-and-wait flow control
 (ii) Sliding window flow control with window sizes of 7 and 15.
 Link specifications :
 Frame length = 1200 bits
 Velocity of propagation = 2×10^8 m/sec
 Link distance = 16 km
 Data rate = 20 mbps
- (b) Why is congestion control required? List the congestion control techniques used in [6]
 (i) packet switching (ii) Frame relay
- (c) Apply Dijkstra's and Bellman Ford Algorithm to the given network and find the least cost path between the source node 1 to all other nodes : [8]



6. (a) How is an ATM virtual connection identified? [5]
 (b) Explain LAN protocol architecture with IEEE 802 reference. Sketch the general MAC frame format and the LLC PDU structure. [10]
 (c) Explain ISDN channels. [5]

7. Write short notes on the following : (any four) [20]
- (a) Token ring
 - (b) ISDN user interface
 - (c) ATM adaptation layer
 - (d) SS7 architecture
 - (e) CSMA/CD.



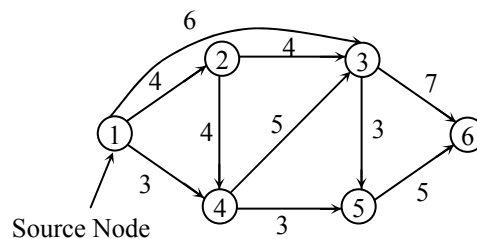
Data Communication and Networking – December 2009

Time : 3 Hrs.]

[Marks : 100

- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any **four** questions out of remaining **six** questions.
 (3) Assume **suitable** data if **necessary**.

1. Answer any four questions : [20]
- (a) Draw the layered OSI network architecture. Explain the function of data link layer in brief.
 - (b) Define line utilisation. Write the expression for utilisation of link for stop and wait flow control and sliding window flow control.
 - (c) What are the conditions to be satisfied for a valid CRC generator polynomial? List the steps involved in it.
 - (d) A message is broken up into three packets. Discuss the transmission of packets using virtual circuit approach of packet switching.
 - (e) Explain CSMA/CD protocol.
2. (a) What are transmission impairments? Compare any two transmission media with reference to their physical structure / characteristics, applications and performance. [10]
- (b) With a suitable sketch explain the connection phases in point to point protocol (PPP), also explain supported sets of protocols to make a PPP a powerful protocol. [10]
3. (a) Explain different types of ARQ techniques. Compare their merits and demerits. [10]
- (b) Sketch HDLC frame structure with respect to it, explain : [10]
- (i) Piggybacking
 - (ii) Bit Stuffing
 - (iii) Data transfer modes
 - (iv) Types of frames in HDLC
4. (a) Two neighbouring nodes A and B use Go-Back-N ARQ with a 3 bit sequence number. Assuming that A is transmitting and B is receiving, show the window position and frame flow for the following sequence of events: [10]
- (i) Initial Position. Before A sends any frames window at A and B.
 - (ii) After A sends 0, 1, 2 and B acknowledge 0, 1 and the ACK are received by A.
 - (iii) A sends frames 3, 4 and then receive REJ3 from B.
 - (iv) A sends frames 3, 4, 5, 6. The acknowledgement RR7 send by B is lost and A does not receive it.
- How would A react? Indicate frame flow diagram.
- (b) Explain with the help of neat sketch the frame format of frame relay. Also give the detail of following : [10]
- (i) FECN
 - (ii) BECN
 - (iii) EA
 - (iv) DE
5. (a) Explain Leaky bucket and Token bucket algorithm in detail. [10]
- (b) Apply Dijkstra's and Bellman Ford Algorithm to the given network and find the least cost path between the source node 1 to all other nodes : [10]



6. (a) Explain ATM adaptation layer and ATM cell in detail. [10]
- (b) Explain the following : [10]
- (i) ISDN Channels and Architecture
 - (ii) ISDN User interfaces
7. Write short notes on (any four) : [20]
- (a) FDDI
 - (b) IEEE 802.3
 - (c) SS7
 - (d) DTE-DCE interface
 - (e) TCP/IP protocol

