

CLASS: IV YEAR / VIII SEMESTER ECE
 SUBJECT NAME: TELECOMMUNICATION SWITCHING AND NETWORKS
 UNIT I – MULTIPLEXING

Part –A (2-marks)

1. What Is Differential Encoding? (NOV/DEC 2008) (NOV/DEC 2013)
2. Define Payload Framing? (NOV/DEC 2008)
3. List out the various transmission system in telecommunication network.
4. Define FDM multiplexing (APRIL/MAY 2008)
5. Define line coding?
6. What is the need for 2 to 4 wire conversion in telephone network?(APRIL 2005)
7. What is Digital-Biphase?(Or) Define digital biphase technique.(Nov/Dec 2012)
8. Draw the frame format of STS-1 level?(DEC 2008)
9. What is Virtual Tributaries?(MAY 2009)
10. What short notes on SONET networks?
11. Draw the block dig of SONET system? (DEC 2009)
12. Compare synchronous and statistical time division multiplexing.
13. What is meant by data scrambling?
14. Define trunk. (JUNE 2006)
15. What is called as loading coils?
16. What is called as clock recovery in TDM?
17. Draw the sketch diagram of subscriber loop multiplexer.
18. Draw the frequency spectrum of a square pulse.
19. What is called as bipolar violations?(MAY 2007)
20. What are the features of Time division multiplexing? (NOV/DEC 2013)
21. What is meant by frequency justification in SONET? (Or) Write down concept of freq justification? (May/June 2013)
22. Represent the given stream of bits using digital biphase codes. The bit stream is 10110111. (May/June 2013)
23. Distinguish between digital and pulse transmission. (Nov/Dec 2012)
24. State the major advantages of differential encoding over NRZ and Biphase coding. (May/June 2012)

25. What is the difference between STS-3 and STS-3C signals. (May/June 2012)

Part –B (8 & 16 marks)

1. Explain the concept of FDM multiplexing & TDM? (NOV 08)
2. Write about SONET frame format? (NOV 08)
3. Describe the DS3 pay load mapping and E4 payload mapping? (Nov/Dec 2012) (NOV'08)
4. Explain the concept of SONET rings? (MAY'06) (or) With neat sketch explain the different types of SONET rings. (May/June 2012) (or) What is meant SONET ring? Explain the different types of SONET ring architecture in detail. (May/June 2013)
5. Explain the working operation and administration of SONET systems? (or) Explain in detail about SONET Administration and maintenance with payload diagram. (Nov/Dec 2012)
6. Explain the following terms (i) TDM loops and rings (ii) Bit interleaving versus word interleaving (iii) Binary N – zero substitution. (May/June 2012)
7. Explain the functions of SONET multiplexing and networks?
8. Discuss about the concept of digital transmission and multiplexing?
9. Draw and explain time division multiplex loops and rings. (Nov/Dec 2012)
10. Give a brief notes on binary N Zero substitution.
11. Draw and explain the operation of unidirectional patch switched and bi-directional line switched SONET rings.
12. Explain the following with respect to digital transmission systems (i) Causes and minimization of inter symbol interference. (May/June 2013) (ii) Techniques of introducing signal transitions in the transmitted waveform to e. framing in TDM
13. Compare unidirectional line sw

14. Explain the SONET architecture with the block diagram of SONET overhead layers. (May/Jun 2013)
15. Explain the means of achieving frame synchronization in time division multiplexing. (May/Jun 2013)
16. Describe in detail about SDH with neat sketch. (Nov/Dec 2013)

UNIT II – DIGITAL SWITCHING

1. What is the need of multidimensional switching?
2. What is switching system? (Or) list the functions of switching system. (May/Jun 2013)
3. Write the equation to compute complexity of a TS switch. (May/Jun 2012)
4. Define space division switching? (or) What is meant by space switching? (May/Jun 2012) (Apr/May 2010)
5. Define Multiplexing.
6. Define path finding?
7. What is non-blocking switching? (May/Jun 2010)
8. Draw the lee graph of 3 stage switching network?
9. Draw the circuit diagram of folded four wire switches?
10. What is BORSCHT? (Nov/Dec 2010)
11. What are the functions of TSI circuit?
12. Write short notes on switch matrix control? (May/Jun 2011)
13. Draw the circuit diagram of 4-wire digital switch?
14. Why higher sampling rates are preferred in analog time division switching? (Nov/Dec 2009)
15. How the control memory in TS switches implemented? (Nov/Dec 2009)
16. Define time division switching. (May/Jun 2009)
17. Define Electronic Switching.
18. Define Digital Switching. (Or) What are the functions of digital switch? (Nov/Dec 2013)
19. What is meant by combinational switching? Give example. (Nov/Dec 2013)
20. What is the function of hybrid circuit? Where it is used? (May/Jun 2013)
21. What are the advantages of digital switching? (Nov/Dec 2012)

22. Give an example for two dimensional switching. (Nov/Dec 2012)
23. Define the terms consolidation and segregation in a digital cross connect systems. (Apr/May 2010)
24. Compare the single stage switching and multistage switching? (May 2010)
25. Define time division time switching. (jun 2009)

Part –B (8 & 16 marks)

1. Explain the following 1) STS switching 2) TST switching.
2. Explain the principle of time division switching. (Nov/Dec 2010)
3. Discuss the concept of switch matrix control.
4. Discuss about the concept of two dimensional switching networks? (May/Jun 2010)
5. Operation of digital memory switch?
6. Explain the concept of digital switching in an analog environment? (or) Discuss the issues and considerations in using digital switching in an analog environment. (May/Jun 2012) (Nov/Dec 2012)
7. Explain the operation and features of No.4 ESS toll switch with a neat diagram. (Nov/Dec 2012) (Nov/Dec 2013)
8. Discuss the operation and application of digital cross connects system. (or) Explain the various operations of electronic digital cross connect system with necessary diagrams. (May/Jun 2012) (Nov/Dec 2013)
9. Draw and explain a three stage non blocking switching matrix and derive an expression for the minimum number of cross points required for non blocking operation. (May/Jun 2012)
10. Discuss the Lee's method of blocking probability analysis.
11. Explain the op blocking prob: (May/Jun 2012)

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12. Explain in detail about space division switching with neat sketch. (Nov/Dec 2012)
13. Explain about elements of SS7 signaling system.(or) Explain the architecture of SS7 signaling with the signaling formats. (Nov/Dec 2012) (May/June 2013) (Nov/Dec 2013)
14. Explain the structure of time space time switching and obtain expression for the implementation complexity. (May/June 2013)

21. What is meant by master slave synchronization?(Nov/Dec 2013)
22. Mention any four sources of instability in network.(May/June 2013)
23. Give the applications of PLL. (Nov/Dec 2012)
24. How probability of misinterpreting is calculated for stuff code. (May/June 2012)
25. Why we go for elastic store with two frame memory?

UNIT III - NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT

1. List out the timing inaccuracies?
2. Define clock instability?
3. What is Doppler shift?
4. What is the application of elastic store?
5. Define slip rate.
6. What is waiting time jitter?
7. List out the various approaches used in synchronizing a digital network
8. Define time interval error.
9. Distinguish jitter and slips.(May/June 2012)
10. Define an elastic store and also give its application. (Nov/Dec 2009)
11. What is Network synchronization? (Apr-2008)
12. What is PLL? (Apr-2008) (Nov/Dec 2013)
13. What is Clock instability?
14. What is clock wander?
15. What are the sources of clock instability? (or) List the source of clock instability in a network? (Apr/May 2010)
16. What is the disadvantage of PLL measurement?
17. Define Slips? (Or) What is meant by slips? (Nov/Dec 2012) (Apr/May 2010)
18. Define Pulse Stuffing? (or) What is meant by pulse stuffing? (Nov/Dec 2009)
19. What is elastic store? (or) What is need for elastic store?(May-2009) .(May/June 2013)
20. Define timing jitter? (May-2009)

Part -B (8 & 16 marks)

1. Describe in details about 1. Phase locked loop 2.Jitter measurements (Nov/Dec 2012) 3.Systematic jitter. . (Or) describe the technique of measuring timing jitter using phase locked loop. (May/June 2013)
2. Explain the concept of network control and network management? (or) What is the role of network management? Explain how is it achieved? (May/June 2013)
3. With suitable block diagram explain the function of jitter removing regeneration repeater.
4. Discuss in details about timing inaccuracies? (or) Write short notes on timing recovery. (Nov/Dec 2012)
5. Explain the working operation of M12 multiplexer. (Apr/May 2010)
6. Explain the concept of network synchronization? (or) Explain the different means of achieving network synchronization. (Nov/Dec 2010) (May/June 2013)
7. Discuss about the concept of network timing performance measurement. . (May/June 2010)
8. Discuss the main sources of clock instability in a digital network. (Nov/Dec 2009) (May/June 2009)
9. Enumerate the different approaches of synchronizing digital networks. (May/June 2009) (or) Explain the basic approaches of network synchronization briefly and discuss the U.S network sync 2010)
10. Write a brief note networks. (Nov/Dec 2010)

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11. Explain in detail about timing, clock recovery synchronization with neat sketch and also discuss about results of poor synchronization. (Nov/Dec 2013)
12. with suitable block diagram explain jitter, source of jitter and jitter measurements. (Nov/Dec 2013)
13. Describe the terms slip. Explain a scheme which controls the occurrence of slip. (May/June 2013)
14. Describe in detail about US network synchronization. (Nov/Dec 2012)
15. Explain about asynchronous multiplexing with neat diagram. (Nov/Dec 2012) (Apr/May 2010)
16. Explain the goals, functions and approaches of network control and management. (May/June 2012)

UNIT IV – DIGITAL SUBSCRIBER ACCESS.

1. Differentiate ADSL and VDSL. (or) What are the differences between ADSL AND VDSL? .(Nov/Dec 2012)
2. Write the concept of PCM modem operation.
3. What is ADSL?
4. Define ISDN?
5. List out 2 principles of ISDN?
6. Name some services provided by ISDN.
7. List out the various features of ISDN B channel?
8. List out the various features of ISDN D channel?
9. Write short notes on basic rate and primary rate access to ISDN.
10. What is S bus?
11. Write notes on fiber in the loop?
12. What is LMDS? (or) Define LMDS. (Nov/Dec 2013)
13. List the features of integrated digital loop carrier system. (May/June 2013)
14. State any two basic features of ISDN – B channels. (Nov/Dec 2009)

15. Write the features and applications of VDSL. (Nov/Dec 2009)
16. What are the functions of ISDN U interface? (May/June 2009)
17. Compare FTTH and FTTC. (May/June 2009)
18. Write about VDSL. (April/May 2008).
19. What is DSL?
20. List out the use of ISDN D Channel.(Nov/Dec 2013)
21. What is meant by MODEM? Where is it used? (May/June 2013)
22. Define hybrid coax systems. .(Nov/Dec 2012)
23. Highlight the objectives of ISDN. (May/June 2012)
24. Mention the applications supported by LMDS. (May/June 2012)
25. Mention the advantages of ADSL. (April/May 2010).
26. Give the basic configuration of hybrid fiber coax system. (April/May 2010).

Part –B (8 & 16 marks)

1. Explain the following i. ISDN D channel protocol ii. Hybrid fibers coax systems. (May/June 2013)
2. Explain in detail about universal ISDN basic rate access, primary rate access architecture and ISDN D channel protocol frame format with neat diagram. (Nov/Dec 2013)
3. Explain in detail about digital satellite service. (Nov/Dec 2013)
4. Explain briefly about digital loop carrier systems.
5. Explain in detail about ADSL with suitable block diagram.
6. Explain the concept of downstream V.90 modem.
7. Explain the following i. Local microwave distribution service ii. Fiber in the loop.
8. Explain the ISDN-J architecture with the functionalities of D channel modules. (May/June 2010)
9. Give a brief account of the various interfaces of ISDN.

Part –B (8 & 16 marks)

1. Discuss about loss system.
2. Explain in details about Delay systems. Derive call delay probability of a delay system. (May/Jun 2012)
3. Explain in detail about finite queues with neat example. (Nov/Dec 2012) (May/Jun 2012)
4. Explain the following traffic characterizations (i). Arrival distribution ii. Holding time distribution.
5. Short notes on following (i). End to end blocking probabilities (Nov/Dec 2012) (ii). Lost call cleared systems.
6. Discuss about the last call cleared system & lost calls returning system in switching system.
7. Explain in detail about traffic characterization for network modeling. (Nov/Dec 2012)
8. Describe the effect of blocking probability on the network traffic. (Apr/May 2010) (or) Derive the call blocking probability of a loss system. (May/Jun 2012)
9. Compare exponential service time and constant service time. (Nov/Dec 2012)
10. Describe the LCC model with infinite sources. (May/Jun 2013) (or) Discuss LCC systems with infinite and finite sources. (Apr/May 2010)
11. What is probability that a talk spurt experience clipping in a TASI system with 10 sources & 5 channels? With 100 sources and 50 channels? Assume activity factor of each talker is 0.4. (Apr/May 2010)

Solution: The clipping probability can be determined as the probability that five or more sources are busy in Poisson process with an average of $A=0.4*10=4$ busy servers

$$\text{Probability clipping} = \sum P_j \quad (4) = e^{-4} (4^5/5! + 4^6/6! + 4^7/7! + 4^8/8! + 4^9/9!) = 0.36$$

For 100 sources, the average number of busy circuits is $A=0.4*100=40$. A speech segment is clipped if 50 or more talkers are active at once. The probability can be determined as

$$\text{Probability clipping} = \sum P_j \quad (40) = 0.04$$

12. Explain the LCC systems with infinite sources and derive the Erlangs B formula. What happens when the sources become finite?
13. Explain the model of delay system. Obtain the expression for the delay probability. (May/Jun 2013)
14. Explain in detail about models and loss estimates with suitable example. (Nov/Dec 2013)
15. A rural telephone exchange normally experiences four call origination per minute. What is the probability that exactly seven calls occur in an arbitrarily chosen interval of 20 seconds?
16. Compare LCH and LCR systems. (Apr/May 2010)
17. Discuss the applications of delay systems in modeling and analyzing communication networks. (Nov/Dec 2013) (May/Jun 2009)
18. Derive the Erlang B formula for modeling the telecommunication switching system. Describe the model in detail. (Apr/May 2010) (Nov/Dec 2009)
19. Discuss LCC systems with infinite and finite sources. Obtain the expression for blocking probability. (May/Jun 2013)
20. A message switching network is to be designed for 95% utilization of its transmission links. Assuming exponentially distributed message lengths and an arrival rate of 10 messages per minute, what is the average waiting time and what is the probability that the waiting time exceeds 5 minutes?

Solution: T] single channel server and a sin P=0.95 arriv

The average service time can be determined as
 $t_m = 0.95/10 = 0.095$

The average waiting time is easily determined as
 $T = (0.95 * 0.095) / (1 - 0.95)$
 $= 1.805 \text{ min}$

The probability of waiting time exceeding 5 min as
 $P(>5) = 0.95e^{-(1-0.95)5/0.095}$
 $= 0.068$

68% of the messages experience queuing delays of more than 5 min.

21. A packet switching node operates with fixed length packets of 300 bits on 9600-bps lines. If the link utilization is to be 90%, what is the average delay through the node? What percentage of packets encounter more than 0.35 sec of delay? What is the average delay if the offered load increases by 10%?

Solution:

Message length = 300 bits, data rate = 9600bps
 Fixed length service time $300/9600 = 0.031 \text{ sec}$
 The average waiting time is
 $T = 0.9 * 0.031 / 2 (1 - 0.9)$
 $= 0.14 \text{ sec}$

The total average delay through the node excluding processing is obtained by adding the average waiting time to the service time

Average delay = $0.140 + 0.031$
 $= 0.171 \text{ sec}$

Waiting time: $0.35 - 0.031 = 10 \text{ services/time}$

12% of the packets experience delays of greater than 0.35 sec. an increase of 10% in the traffic intensity implies that the new offered load is 0.99 erlang

The average waiting time
 $T = 0.99 * 0.031 / 2 (1 - 0.99)$
 $= 1.53 \text{ sec}$

The average delay through the node increases nine fold to a value of $1.53 + 0.031 = 1.56 \text{ sec}$

22. A PCO is installed in a busy part of a town, 150 persons use the booth every day. Average holding time for a call is 1.5mm. Find the probability of delay and average waiting time. Assume a single server queue. (Nov/Dec 2009)