CBCS SCHEME

USN | | | | | | | | | | **18EC71**

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Computer Networks

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain the functions of each layer in TCP/IP protocol suite. **(10 Marks)**
b. Explain the components of a data communication. **(05 Marks)**
c. Illustrate the concept of multiplexing and demultiplexing at the upper three layers of TCP/IP protocol suite. **(05 Marks)**

OR

2 a. Explain four physical topologies of a network. **(10 Marks)**
b. With a neat diagram illustrate the concepts of encapsulation and decapsulation in internet. **(10 Marks)**

Module-2

3 a. Describe the operation of stop and wait protocol with FSM and flow diagram. **(12 Marks)**
b. Define ARP and its position in TCP/IP protocol suite and also explain ARP operation with relevant diagram. **(08 Marks)**

OR

4 a. Explain how collisions are avoided through the use of CSMA/CA's three strategies with flow diagram. **(10 Marks)**
b. Explain briefly 10 Base 5 and 10 Base T implementation. **(06 Marks)**
c. A slotted ALOHA network transmits 200 bit frames using a shared channel with a 200 kbps bandwidth. Find the throughput if the system (all the stations together) produces.
(i) 1000 frames per second
(ii) 500 frames per second
(iii) 250 frames per second **(04 Marks)**

Module-3

5 a. Compare and contrast connectionless packet-switched network with a virtual-circuit packet switched network using necessary diagrams. **(08 Marks)**
b. An organization is granted a block of addresses with beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets, one sub-block of 10 addresses, one subblock of 60 addresses and one subblock of 120 addresses. Design the subblocks. **(06 Marks)**
c. Explain MPLS packet, briefly. **(06 Marks)**

OR

6 a. Illustrate IPv4 datagram format. **(10 Marks)**
b. Explain path-vector routing by using spanning tree. Also apply path-vector algorithm for updating path-vectors. **(10 Marks)**

Module-4

7 a. Explain FSMs for Go-Back-N protocol with a neat diagram. **(08 Marks)**

b. Explain the concept of sliding window in circular and linear formats with suitable figures. **(07 Marks)**

c. Explain why the size of the Sender and Receiver windows chosen as one half of 2^m for Selective Repeat Protocol. **(05 Marks)**

OR

8 a. Explain TCP segment format. **(08 Marks)**

b. Illustrate connection establishment in TCP using Three-way handshaking using suitable example. **(07 Marks)**

c. Explain briefly Taho TCP with FSM. **(05 Marks)**

Module-5

9 a. Explain non-persistent connection with suitable example. **(08 Marks)**

b. Explain client-server paradigm with an example. **(06 Marks)**

c. Describe the three Mail Transfer Phases. **(06 Marks)**

OR

10 a. Explain DNS resolution and its type Recursive Resolution. **(07 Marks)**

b. Explain briefly local versus remote lagging in Telnet with a neat diagram. **(07 Marks)**

c. Describe the components of SSH. **(06 Marks)**

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18TE71

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Optical Communication

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Distinguish between step index and graded index fibers. **(10 Marks)**

b. A typical relative refractive index difference for an optical fiber designed for long distance transmission is 1%. Estimate the numerical aperture and solid acceptance angle in air for the fiber when core index is 1.46. Further, calculate the critical angle at the core-cladding interface within the fiber, it may be assumed that the concepts of geometric optics hold for the fiber. **(10 Marks)**

OR

2 a. What are the advantages of optical fiber communication? **(10 Marks)**

b. Explain a digital optical fiber transmission link using a semiconductor laser source and an avalanche photodiode detector. **(10 Marks)**

Module-2

3 a. Briefly explain about stimulated Raman scattering. **(10 Marks)**

b. Silica has an estimated frictive temperature of 1400°K with an isothermal compressibility of $7 \times 10^{-11} m^2 N^{-1}$. The refractive index and the photoelastic coefficient for silica are 1.46 and 0.286 respectively. Determine the theoretical attenuation in decibels per kilometer due to the fundamental Rayleigh scattering in an silica at optical wave length of 0.63 and 1.00. Bolzman's constant is $1.381 \times 10^{-21} JK^{-1}$. **(10 Marks)**

OR

4 a. Derive an expression for material dispersion parameter M due to different group velocities. **(10 Marks)**

b. An 6km optical link consists of multimode step index fiber with a core RI of 1.5 and a relative index difference of 1%. Estimate:

i) The delay difference between the slowest and fastest modes at the fiber output.

ii) The rms pulse broadening due to intermodal dispersion on the link.

iii) The maximum bit rate that may be obtained without substantial errors on the link assuming only intermodal dispersion.

iv) Bandwidth-length product corresponding to (iii). **(10 Marks)**

Module-3

5 a. Derive an expression for internally generated power and efficiency in an LED. **(10 Marks)**

b. The radiative and non radiative recombination life times of the minority carriers in the active region of a double heterojunction LED are 60ns and 100ns respectively. Determine the total carrier recombination life time and the power internally generated within the device when the peak emission wavelength is 0.87 μm at a drive current of 40mA. **(10 Marks)**

OR

6 a. With a neat sketch, explain the pin photodetector physical principles. **(10 Marks)**

b. Write a brief note on response time of an photo diode. **(10 Marks)**

Module-4

7 a. With a implementation of a typical WDM network explain operational principles of WDM. **(10 Marks)**

b. What are isolators? Explain the design of polarization – independent isolator. **(10 Marks)**

OR

8 a. List the applications of optical amplifier and explain basic operation of a generic optical amplifier. **(10 Marks)**

b. With a neat Erbium doped fiber amplifier architecture. Discuss three possible configuration of an EDFA. **(10 Marks)**

Module-5

9 a. Explain the evolution of optical fiber network. **(10 Marks)**

b. Explain the network topologies with neat sketches. **(10 Marks)**

OR

10 a. Explain the optical public telecommunications network hierarchy with a neat sketch. **(10 Marks)**

b. Distinguish between metropolitan and local area networks. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
VLSI Design

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data may be suitably assumed.

Module-1

1 a. Derive an expression for drain current in linear and saturation region. **(08 Marks)**
b. Draw the CMOS inverter circuit and explain its D.C. characteristic. **(08 Marks)**
c. Implement a 2:1 MUX using transmission gate. **(04 Marks)**

OR

2 a. Explain the non ideal IV effect of MOSFET with respect to CMOS channel length modulation and mobility degradation. **(08 Marks)**
b. Explain the operation of nMOS transistor with IV characteristics. **(08 Marks)**
c. Sketch a static CMOS gate computing $y = \overline{(A+B+C)D}$. **(04 Marks)**

Module-2

3 a. Explain CMOS nWell process with necessary diagrams. **(12 Marks)**
b. Mention different types of MOSFET capacitances with necessary diagrams and equations also MOSFET. Capacitances in cut off, linear and saturation region. **(08 Marks)**

OR

4 a. Define scaling. Explain constant field scaling and constant voltage scaling and why constant voltage scaling is usually preferred over full scaling. **(07 Marks)**
b. With neat diagram, explain the Lambda based design rules for two metal layers. **(06 Marks)**
c. Draw the layout for $f = \overline{ABC}$ and estimate the cell area. **(07 Marks)**

Module-3

5 a. Develop the RC delay model to compute the delay of the logic circuit and calculate the delay of unit sized inverter driving another unit in vertex. **(06 Marks)**
b. Estimate t_{pdf} and t_{pdr} for the 3 input NAND gate shown in Fig.Q.5(b) if the output is loaded with h identical NAND gates. **(08 Marks)**

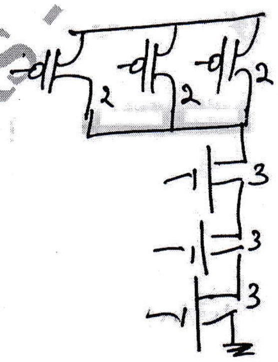

Fig.Q.5(b)

c. Explain eVSL with an example. **(06 Marks)**

OR

6 a. Explain: i) Pseudo-nMOS ii) Ganged CMOS with necessary circuit examples. **(06 Marks)**

b. If a unit transistor has R = 10KΩ and e = 0.1fF in a 65nm process, compute the delay, in picoseconds, of the inverter Fig.Q.6(b) with a fan out of h = 4. **(06 Marks)**

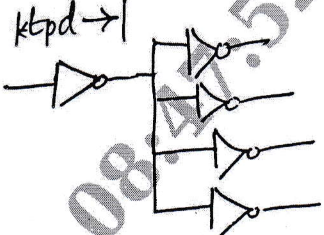

Fig.Q.6(b)

c. Explain linear delay model compare the logical effort of the following gates with the help of schematic diagrams: i) 3-input NAND gate ii) 3 input NOR gate. **(08 Marks)**

Module-4

7 a. Explain Resettable latches and flipflops using CMOS transmission gate. **(06 Marks)**

b. Explain Dynamic logic. **(06 Marks)**

c. Consider the two nFET chain in Fig.Q.7(c). The power supply is set to a value of V_{DD} = 3.3V and the nFET threshold voltage is V_{Tn} = 0.55V. Find the output voltage V_{out} at the right side of the chain for the following values: i) V_{in} = 2.9V ii) V_{in} = 3.0V iii) V_{in} = 1.4V iv) V_{in} = 3.1V. **(08 Marks)**

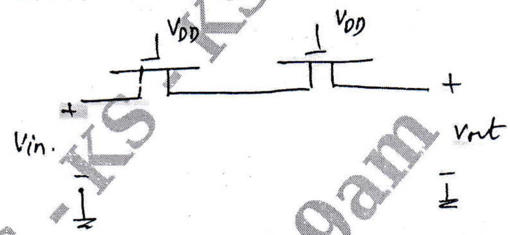

Fig.Q.7(c)

OR

8 a. Explain pulsed latches with schematic and waveforms. **(06 Marks)**

b. The output of an nFET is used to drive the gate of another nFET as shown in Fig.Q.8(b). Assume that V_{DD} = 3.3V and V_{tn} = 0.6V. Find the output voltage V_{out} when the input voltages are at following values:

i) V_a = 3.3V and V_b = 3.3V

ii) V_a = 2.0V and V_b = 2.5V.

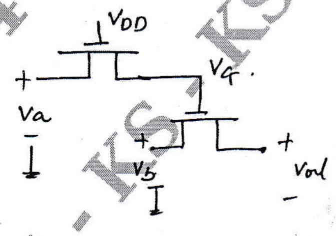

Fig.Q.8(b) **(08 Marks)**

c. Explain Domino logic. **(06 Marks)**

Module-5

9 a. With neat schematic diagram explain the operation of Full CMOS static RAM cell. **(10 Marks)**

b. Explain the different fault models. **(10 Marks)**

OR

10 a. With neat schematic diagram explain the operation of three transistor DRAM cell. **(10 Marks)**

b. Write short notes on: i) Built in Self Test ii) Scan Design. **(10 Marks)**

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18TE72

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Wireless Communication

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain two ray model with necessary diagram and equations. **(10 Marks)**

b. Derive an expression for path loss in free space propagation. **(10 Marks)**

OR

2 a. Discuss practical link budget design in path loss models. **(05 Marks)**

b. Explain three basic propagation mechanisms in mobile radio communication. **(05 Marks)**

c. Assume a receiver is located 10 km from a 50 W transmitter. The carrier frequency is 900 MHz, free space propagation is assumed. The antenna gain at transmitter and receiver is 1 and 2 respectively. Calculate:

(i) Power received at receiver

(ii) The magnitude of the E-field at the receiver antenna

(iii) The power flux density

(iv) The rms voltage applied to the receiver input. The receiver antenna has 50Ω impedance and is matched to the receiver. **(10 Marks)**

Module-2

3 a. Explain Rayleigh and Ricean distribution. **(10 Marks)**

b. Explain types of small scale fading. **(10 Marks)**

OR

4 a. Define the following:

(i) Blocked call (ii) Request rate (iii) Load

(iv) GOS (v) Traffic intensity **(10 Marks)**

b. What is channel assignment strategy? Discuss Handoff strategies in mobile communication. **(10 Marks)**

Module-3

5 a. Explain three popular capacity improvement techniques in cellular systems. **(10 Marks)**

b. Define capacity of cellular system. Derive an expression for maximum radio capacity with suitable assumptions. **(10 Marks)**

OR

6 a. Compare FDMA and TDMA in detail. **(12 Marks)**

b. Discuss packet radio ALOHA protocol. **(08 Marks)**

Module-4

7 a. With a neat diagram, explain the global system for mobile communication. **(10 Marks)**

b. Write notes on: (i) RACH (ii) FCCH (iii) SACCH (iv) FACCH **(10 Marks)**

OR

8 a. Explain Handover between two BTS's that are connected to different BSC's but same MSC. **(10 Marks)**

b. With figure, discuss structure of time slots used in GSM. **(10 Marks)**

Module-5

9 a. Explain spreading and modulation in uplink of IS-95 system with neat block diagram. **(10 Marks)**

b. Explain long and short spreading codes and walsh codes. **(10 Marks)**

OR

10 a. Explain error correction coding for 8.6 Kbs and 13.3 Kbps in uplink of IS-95 with the encoding procedure. **(10 Marks)**

b. Explain with suitable block diagram of an IS-95 mobile station transmitter. **(10 Marks)**

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18EC732

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Satellite Communication

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. State and explain all the three Kepler's laws with necessary figures and expressions. **(07 Marks)**

b. The apogee and perigee distances of a satellite orbiting in an elliptical orbit are respectively 45000km and 7000km. Determine the following:
i) Semi major axis of the elliptical orbit.
ii) Orbit eccentricity.
iii) Distance between the center of the Earth and the centre of the elliptical orbit. **(06 Marks)**

c. With neat diagram explain the different types of satellite orbits. **(07 Marks)**

OR

2 a. With neat diagram, explain the following orbital parameters:
i) Apogee ii) Ascending node iii) Eccentricity iv) Argument of perigee. **(08 Marks)**

b. Explain spin stabilization and three axis stabilization techniques for satellite altitude control. **(06 Marks)**

c. Explain the various orbital effects on satellites performance. **(06 Marks)**

Module-2

3 a. Explain the solar energy driven power supply system of a satellite. **(06 Marks)**

b. Write a note on payload subsystem of satellite. **(06 Marks)**

c. With neat block diagram, explain earth station architectures. **(08 Marks)**

OR

4 a. Explain Tracking, Telemetry and Command (TT&C) subsystem. **(08 Marks)**

b. Briefly explain the following types of earth stations:
i) Fixed Satellite Service (FSS) Earth station.
ii) Broadcast Satellite Service (BSS) Earth station. **(06 Marks)**

c. With neat block diagram, explain satellite tracking system. **(06 Marks)**

Module-3

5 a. Explain MCPC/FDM/FM/FDMA system with typical block diagram. **(10 Marks)**

b. What are the advantages and disadvantages of TDMA over FDMA? **(10 Marks)**

OR

6 a. Explain TDMA typical frame structure. **(10 Marks)**

b. Briefly explain important parameters that influence the design of a satellite communication link. **(10 Marks)**

Module-4

7 a. With neat diagram explain the two types of satellite transponders. **(10 Marks)**

b. Explain the advantages and disadvantages of satellite with respect to terrestrial networks. **(10 Marks)**

OR

8 a. Explain the satellite cable television. **(10 Marks)**

b. With neat block diagram, explain the basic elements of satellite communication system. **(10 Marks)**

Module-5

9 a. Explain the Optical Remote Sensing system and Thermal Infrared Remote Sensing system. **(10 Marks)**

b. Explain the operation of the control segment of GPS system. **(10 Marks)**

OR

10 a. With neat block diagram, explain a typical GIS system in remote sensing. **(10 Marks)**

b. List and explain all the applications of weather forecasting satellite. **(10 Marks)**

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18EC744

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
Cryptography

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Draw the model of symmetric crypto system and explain. **(06 Marks)**

b. Explain rules used for playfair cipher and encrypt plain text "TECHNOLOGY" with keyword "ENCRYPT". **(08 Marks)**

c. List the modular arithmetic operation properties. **(06 Marks)**

OR

2 a. Using Hill cipher technique encrypt and decrypt the plain text "ATTACK" using the key = $\begin{bmatrix} 2 & 3 \\ 3 & 6 \end{bmatrix}$. **(10 Marks)**

b. Explain extended Euclidean algorithm with an example. **(04 Marks)**

c. Find GCD of (1970, 1066) using Euclidean algorithm. **(06 Marks)**

Module-2

3 a. With a neat block diagram, explain DES encryption algorithm. **(08 Marks)**

b. Explain with a neat diagram, AES encryption process. **(08 Marks)**

c. With neat block diagram, describe ShiftRows transformation technique. **(04 Marks)**

OR

4 a. Describe the key expansion algorithm used in AES with neat diagram. **(08 Marks)**

b. Illustrate the Feistel encryption and decryption process with its structure. **(06 Marks)**

c. With neat block diagram, explain Mixed Columns Transformation technique. **(06 Marks)**

Module-3

5 a. What are the Groups, Rings and Fields? Explain. **(06 Marks)**

b. State and prove Fermat's and Euler's theorem. **(10 Marks)**

c. Find whether 2 is primitive root of 11. **(04 Marks)**

OR

6 a. Define Euler's Totient Function. Determine the Euler's totient function of:
(i) 37 (ii) 35 (iii) 600 (iv) 32 (v) 21 **(07 Marks)**

b. For $f(x) = x^7 + x^5 + x^4 + x^3 + x + 1$ and $g(x) = x^3 + x + 1$, perform addition, subtraction, multiplication and division over GF(2). **(08 Marks)**

c. Find the gcd of the given polynomials $a(x) = x^6 + x^5 + x^4 + x^3 + x^2 + x + 1$ and $b(x) = x^4 + x^2 + x + 1$. **(05 Marks)**

Module-4

7 a. Perform encryption and decryption using the RSA algorithm for the values p = 3, q = 5, e = 3 and m = 4. **(06 Marks)**

b. Explain Diffie-Hellman key exchange algorithm with an example. **(08 Marks)**

c. Write a note on elliptic curve cryptography. **(06 Marks)**

OR

8 a. Show that 7 is a primitive root of 71, where q is common prime and 2 is primitive root used by Alice and Bob for Diffie-Hellman key exchange with q = 7.1 and $\alpha = 7$.

(i) Find Bob's public key if Bob has private key 12?

(ii) If Alice has a private key of 5, what is the shared key k with Bob? **(10 Marks)**

b. Which are the possible five approaches to attack RSA algorithm? **(05 Marks)**

c. Describe the RSA encryption and decryption algorithm. **(05 Marks)**

Module-5

9 a. Explain linear feedback shift register with necessary diagram. **(08 Marks)**

b. Describe the following with diagrams:

(i) Generalized Geffe generator

(ii) Threshold Generator

(iii) Multispeed Inner-product generator **(12 Marks)**

OR

10 a. Explain PKZIP data compression algorithm. **(08 Marks)**

b. Write notes on:

(i) Gifford

(ii) Algorithm M

(iii) Rambutan algorithms

(iv) Jennings generator **(12 Marks)**

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