CBCS SCHEME

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18EC71

Seventh Semester B.E. Degree Examination, June/July 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 four fundamental characteristics on which effectiveness of data communications system depends on. **(04 Marks)**

b. Name the four basic network topologies and discuss advantages and disadvantages of each type. For 'n' devices in network, what is the number of cable links required for each topology? **(06 Marks)**

c. Write a neat diagram showing logical connections between layers of TCP/IP model of source and destination hosts. Explain responsibilities of each layer of TCP/IP model in brief. **(10 Marks)**

OR

2 a. Explain the basic principles of protocol layering that needs to be followed in network communication. **(04 Marks)**

b. With a neat diagram and example explain various modes of communication. **(06 Marks)**

c. With a neat diagram, explain the process of encapsulation and decapsulation of data in layers of TCP/IP model at source host, at router and destination host. **(10 Marks)**

Module-2

3 a. Explain the concept of bit stuffing and byte stuffing used in framing with a neat diagram clearly showing flag bytes in both the cases and also mention the importance of flag bytes. **(07 Marks)**

b. With a neat diagram, explain various field of Ethernet frame format. What are the minimum and maximum length of the frame considering the header field? **(07 Marks)**

c. Explain the 10Base-S and 10Base-T standard Ethernet implementation with all necessary details and diagram. **(06 Marks)**

OR

4 a. What are the three persistence methods used in CSMA mechanism to avoid the collisions? Explain them in detail with neat diagram. **(06 Marks)**

b. In the standard Ethernet with the transmission rate of 10 mbps, we assume that the length of the medium is 2500 m and the frame size is 512 bits. The propagation speed of a signal in a cable is 2×10^8 m/s.

(i) Calculate the efficiency of Standard Ethernet for given specification.

(ii) If length of the medium and frame size is changed to 3500 m and 1024 bits, find the efficiency. **(06 Marks)**

c. Write a neat finite state machine diagram of stop-and-wait protocol and explain various states the sender and receiver will undergo. **(08 Marks)**

Module-3

5 a. Explain in detail, various services provided by network layer. **(04 Marks)**

b. Explain various classes of IP address clearly specifying the total number of bits required for host I_D and network I_D for each class. **(06 Marks)**

c. Convert following IP addresses into dotted-decimal notation and also mention for which class the IP address belongs to,

(i) 01011110 10110000 01110101 00010101
(ii) 10001001 10001110 11010000 00110001
(iii) 01010111 10000100 00110111 00001111
(iv) 01110111 11110011 10000111 11011101 **(04 Marks)**

d. What is Network Address Translation (NAT)? Explain how NAT helps in address translation with a neat diagram. **(06 Marks)**

OR

6 a. With a neat diagram, explain datagram approach and virtual circuit approach of packet switching network. **(08 Marks)**

b. Explain various fields of IPV_4 datagram with a neat diagram. **(08 Marks)**

c. Identify the classes for which the following IP addresses belong to and also represent them in binary notation.

(i) 110.11.5.88
(ii) 12.74.16.18
(iii) 201.24.44.32
(iv) 245.34.2.8 **(04 Marks)**

Module-4

7 a. Explain connection lens and connection-oriented service showing movements of packets using timeline. **(10 Marks)**

b. Explain why the size of send window in Go-Back-N must be less than 2^n. **(06 Marks)**

c. Explain various fields of UDP header diagram. **(04 Marks)**

OR

8 a. With relevant diagrams, explain working principle Go-Back-N ARQ flow control protocol. **(10 Marks)**

b. List and explain various services provided by User Datagram Protocol (UDP). **(05 Marks)**

c. Explain the flow control and Error Control Services of transport layer in brief. **(05 Marks)**

Module-5

9 a. Explain request and response message formats of HTTP with a neat diagram. **(10 Marks)**

b. List and explain actions carried out by HTTP methods. **(04 Marks)**

c. What is File Transfer Protocol (FTP)? Explain components of client and server of FTP model with a neat diagram. **(06 Marks)**

OR

10 a. Write a neat diagram, showing various components of E-mail architecture and explain steps involved in e-mail communication between sender and receiver. **(10 Marks)**

b. What is Secure Shell (SSH)? Explain various components of Secure Shell. **(06 Marks)**

c. Bring out the key differences between TELNET and SSH. **(04 Marks)**

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18TE71

Seventh Semester B.E. Degree Examination, June/July 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. Outline advantages of optical fiber over copper wires of co-axial cables that are used in communication link as transmission media. **(06 Marks)**

b. What is Numerical Aperture? Make use of Ray theory, to derive an expression for Numerical Aperture (NA) and maximum acceptance angle of Step Index Optical fiber in term of refractive indices of Core and Cladding material. **(08 Marks)**

c. A silica optical fiber with a core diameter large enough has a refractive core index of 1.50 and a cladding refractive index of 1.47. Determine (i) The critical angle at the core-cladding interface (ii) The NA of the fiber (iii) The acceptance angle in air for the fiber. **(06 Marks)**

OR

2 a. With a neat schematic, explain refractive index profile and ray transmission in multimode step index and graded index. **(08 Marks)**

b. Determine the cut off wavelength for a step index fiber for single mode operation when the core refractive index and radius are 1.46 and 4.5 μm, with relative refractive index difference being 0.25%. **(04 Marks)**

c. List the requirements that must be satisfied for selection the fiber material. Hence discuss about fiber types based on materials used for manufacturing. **(08 Marks)**

Module-2

3 a. Discuss the importance of signal attenuation in an optical fiber. Explain about material absorption ion in optical fibers. **(08 Marks)**

b. A 15 km optical fiber link uses fiber with a loss of 1.5 dB/km the fiber is joined every kilometer with connectors which gives an attenuation of 0.8 dB each. Determine the minimum mean optical power which must be launched into the fiber in order to maintain a mean optical power level of 0.3 μw at the detector. **(04 Marks)**

c. Explain about the fiber bend losses with relevant diagram and equations. **(08 Marks)**

OR

4 a. What is fiber alignment and joint loss? Explain the three possible types of misalignment which may occur when Joining compatible optical fibers, with neat diagram. **(08 Marks)**

b. Classify the optical fiber couplers based on mechanism of power transfer and write a short note on Star fiber couplers with neat diagram and equations. **(08 Marks)**

c. A 32×32 port multimode fiber transmissive star coupler has 1 mw of optical power launched into a single i/p port. The average measured optical power at each port is 14 μw. Determine the total loss increased by the star couplers and the average insertion loss through the device. **(04 Marks)**

Module-3

5 a. Explain and derive the equations for Quantum efficiency (η_{int}) and LED power. **(08 Marks)**

b. A double hetrojunction InGaAsP LED emitting at a peak wavelength of 1310 nm has radiative and non-radiative recombination times of 30 and 100 nsec respectively. The drive current is 40 mA. Determine

(i) The bulk recombination time

(ii) The internal quantum efficiency and

(iii) The internal power level. **(04 Marks)**

c. Explain Fabry-Perot resonator cavity of LASER with a neat diagram. **(08 Marks)**

OR

6 a. Illustrate the principle of conversion of optical signal to electrical signal by a PIN photodetector. **(08 Marks)**

b. An InGaAs PIN photo detector has the following parameters at a wavelength of 1300 nm, $I_D = 4$ ma; $\eta = 0.9$, $R = 1$ KΩ and the surface leakage current is negligible. The incident optical power is 300 nw and the receiver bandwidth is 20 MHz. Estimate the various noise terms of the receiver. Compare the losses and give conclusion. **(04 Marks)**

c. Explain the operation of a digital optical link with a neat block diagram and waveforms show the basic sections of an optical receiver. **(08 Marks)**

Module-4

7 a. Explain the operational principles of WDM. Also sketch the transmission bandwidths in the O and C bands. **(10 Marks)**

b. Explain the construction and working of an optical isolator. **(07 Marks)**

c. The input wavelength of 2×2 silicon Mach-Zender interferometer multiplexers are separated by 10 GHz (i.e. $\Delta\lambda = 0.08$ nm at 1550 nm) with $\eta_{eff} = 1.5$,

(i) Determine waveguide length difference Δ_L.

(ii) If the frequency separation is 130 GHz, determine the wavelength difference Δ_L. **(03 Marks)**

OR

8 a. With neat diagram, explain the operation of a Raman amplifiers. **(06 Marks)**

b. Give a brief description of diffraction gratings and tunable light sources. **(08 Marks)**

c. Explain the amplification mechanism of Erbium-Doped fiber amplifier. **(06 Marks)**

Module-5

9 a. With a neat diagram, explain the principle of operation of the Public telecommunication network hierarchy. **(10 Marks)**

b. Explain about networking node elements and optical cross connect ($O \times C$) with neat diagrams. **(10 Marks)**

OR

10 a. Describe about Internet Protocol for optical networks. **(10 Marks)**

b. Show the structure of a metropolitan area network and explain. **(10 Marks)**

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18EC72

Seventh Semester B.E. Degree Examination, June/July 2024
VLSI Design

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define Moore's law. **(02 Marks)**

b. Consider the design of a CMOS compound OR-OR-AND invert gate computing $F = \overline{(A+B)\cdot(C+D)}$.

(i) Sketch a transistor level schematic

(ii) Sketch a stick diagram

(iii) Estimate area from a stick diagram. **(10 Marks)**

c. Derive the transfer characteristics of CMOS Inverter (graphical). **(08 Marks)**

OR

2 a. Explain all the non-ideal effects in MOS transistor. **(10 Marks)**

b. With neat sketches explain the operation of MOSFET and derive the equation for drain current in all the regions. **(10 Marks)**

Module-2

3 a. Explain VLSI design flow. **(10 Marks)**

b. What is scaling? What are types of scaling and write scaling factors for device parameters? **(10 Marks)**

OR

4 a. Draw the schematic and layout of two input NAND gate. **(06 Marks)**

b. Explain layout design rules for well, transistor rule and metal rules. **(08 Marks)**

c. Define terms: (i) Metallization (ii) Passivation (iii) Metrology **(06 Marks)**

Module-3

5 a. Explain Elmore delay model. **(03 Marks)**

b. Define logical effort. Write the logical efforts of common gates. **(10 Marks)**

c. Estimate the delay of the Fanout - of - 4 (FO4) inverter shown in Fig.Q5(c). Assume the inverter is constructed in a 180 nm process with $\tau = 15$ ps.

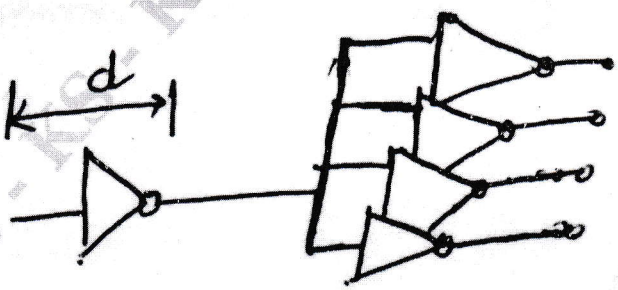

Fig.Q5(c) **(07 Marks)**

OR

6 a. What is Ratioed logic? Explain following ratioed logic circuits:
(i) Pseudo nMOS
(ii) Ganged CMOS
(iii) Source follower pull-up logic **(12 Marks)**

b. Explain Cascade Voltage Switch Logic (CVSL). Realize the input AND/NAND using CVSL. **(08 Marks)**

Module-4

7 a. Explain the general structure of ratioed synchronous dynamic circuits. **(05 Marks)**

b. With necessary circuit diagram, explain dynamic shift register (ratioless) with enhancement load. **(08 Marks)**

c. What are the advantages of dynamic CMOS logic and explain the working of dynamic CMOS inverter. **(07 Marks)**

OR

8 a. Write the basic building block of a CMOS transmission gate dynamic shift register. **(04 Marks)**

b. With generalized circuit diagram, explain domino CMOS logic and using the same realize the following Boolean function: $Z = AB + (C + D)(E + F) + GH$ **(11 Marks)**

c. With necessary diagram, explain a D flipflop with two phase non-overlapping clocks. **(05 Marks)**

Module-5

9 a. With neat circuit diagram, explain full CMOS SRAM cell. **(08 Marks)**

b. Draw the circuit of 3-bit BIST register and explain. **(06 Marks)**

c. Explain the terms: (i) Observability (ii) Fault coverage (iii) Controllability **(06 Marks)**

OR

10 a. With necessary circuit diagram, explain the operation of three transistor DRAM cell. **(08 Marks)**

b. What is a fault model? Explain stuck-at model with examples. **(07 Marks)**

c. Explain the logic verification principles. **(05 Marks)**

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18TE72

Seventh Semester B.E. Degree Examination, June/July 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. Establish the relationship between radiating power to electric field in free space. **(08 Marks)**

b. Define Path loss and derive the expression for path loss in free space. **(06 Marks)**

c. If a transmitter produces 100 W of power and this power is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power at a free space distance of 1 km from the antenna. What is the P_r(100 km) ? Assume unity gain for the receiver antenna. **(06 Marks)**

OR

2 a. Illustrate three basic propagation mechanism in mobile radio communication. **(06 Marks)**

b. Given the following geometry, determine
(i) The loss due to knife edge diffraction.
(ii) The height of the obstacle required to induce 6 dB diffraction loss. Assume f = 900 MHz **(06 Marks)**

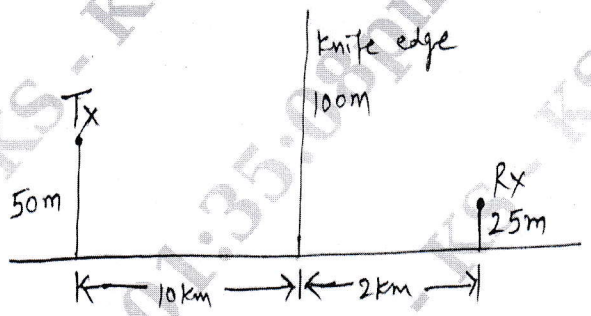

Fig. Q2 (b)

c. Determine the following parameters by using Two-Ray Ground reflection model.
(i) E-field of E_{LOS} and E_g.
(ii) Path difference (Δ) and phase difference (θ_Δ).
(iii) Received power (P_r)
(iv) Compare the path loss of free space model and Two-ray Ground reflection model. **(08 Marks)**

Module-2

3 a. Determine the impulse response model of a multipath channel. **(10 Marks)**

b. Illustrate the Rayleigh and Rician fading distributions used in wireless communication. **(10 Marks)**

OR

4 a. Illustrate the following :
(i) Frequency reuse concept used in cellular communication.
(ii) Channel assignment strategies
(iii) Hand-off strategies. **(12 Marks)**

b. Illustrate the concept of Signal to Interference Ratio (SIR) by considering a cluster size of 7 and there are six co-channel interfering cells in the first tier. **(08 Marks)**

Module-3

5 a. Explain space division multiple access (SDMA). **(10 Marks)**

b. A normal GSM has 3 start bits, 3 stop bits, 26 training bits for allowing adaptive equalization, 8.25 guard bits and 2 bursts of 58 bits of encrypted data which is transmitted at 270.833 Kbps in the channel. Determine

(i) Number of overhead bits per frame.
(ii) Total number of bits per frame.
(iii) Frame rate.
(iv) Time duration of a slot.
(v) Frame efficiency. **(10 Marks)**

OR

6 a. Illustrate capacity improvement techniques used in cellular communication. **(12 Marks)**

b. If GSM uses a frame structure where each frame consists of 8 time slots, and each time slot contains 156.25 bits, and data is transmitted at 270.833 kbps in the channel. Determine

(i) The time duration of a bit.
(ii) The time duration of a slot.
(iii) The time duration of a frame.
(iv) How long must a user occupying a single time slot wait between two successive transmissions? **(08 Marks)**

Module-4

7 a. With neat block diagram, explain the architecture of GSM system. **(10 Marks)**

b. With neat block diagram, explain channel coding for voice data in GSM. **(05 Marks)**

c. With neat diagram, explain the hierarchy of GSM frames used for traffic and control channels. **(05 Marks)**

OR

8 a. Explain physical and logical channels used in GSM. **(10 Marks)**

b. With neat diagram, explain Hand-off between two BTSs which are associated with two different MSCs. **(10 Marks)**

Module-5

9 a. With a neat block diagram, of an IS-95 mobile station transmitter, interpret the role and key functions of each block. **(10 Marks)**

b. Explain the role and importance of all logical and physical channels used in IS-95. **(10 Marks)**

OR

10 a. With neat block diagram, explain IS-95 spreading and modulation in the down link. **(10 Marks)**

b. Write a short note on :

(i) Long and short spreading codes.
(ii) Walsh codes.
(iii) $1\times EV-DO$ **(10 Marks)**

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18EC732

Seventh Semester B.E. Degree Examination, June/July 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. Outline the Kepler's law of planetary motion. Derive the expression for orbital period. **(08 Marks)**

b. With the help of neat diagram, explain :
i) Apogee and Perigee
ii) Prograde and Retrograde
iii) Inclination angle
iv) Argument of perigee. **(08 Marks)**

c. Verify that a geostationary satellite needs to beat a height of about 35780km above the surface of the earth. Assume radius of earth to be 6380km and $\mu = 39.8 \times 10^{13} N/mm^2/kg$. **(04 Marks)**

OR

2 a. Explain injection velocity and resulting satellite trajectories with relevant expressions. **(10 Marks)**

b. Briefly explain any 4 orbital parameters required to determines a satellite orbit. **(06 Marks)**

c. List the conditions of a satellite in order to remain above the same point on the earth's surface. **(04 Marks)**

Module-2

3 a. Describe the Tracking, Telemetry and command subsystem of a communication satellite. **(08 Marks)**

b. What are the different components of a satellite's power supply subsystem. Briefly describe the role of each component. **(08 Marks)**

c. Define payload. What are the typical payloads of onboard an earth observation and scientific research. **(04 Marks)**

OR

4 a. List and explain the types of earth station based on their usage. **(07 Marks)**

b. Describe the satellite tracking system with the help of neat diagram and explain any two tracking techniques. **(08 Marks)**

c. Define earth station testing. How are the unit and subsystem testing of earth-station done? **(05 Marks)**

Module-3

5 a. Illustrate the operational principle of FDMA system and what is the significance of guard band in FDMA system. **(06 Marks)**

b. Write the TDMA frame structure and explain each one of the block. **(08 Marks)**

c. Compare DS/CDMA, FH/CDMA and TH/CDMA system. **(06 Marks)**

OR

6 a. Obtain the transmission equation of satellite link. **(06 Marks)**
b. Discuss the parameters influence the design of satellite communication link. **(10 Marks)**
c. Discuss how the frequency re-use is applied n SDMA. **(04 Marks)**

Module-4

7 a. Define transponder. Explain the types of transponder used in satellite. **(10 Marks)**
b. Discuss the advantages and disadvantages of satellites over terrestrial network. **(10 Marks)**

OR

8 a. With a neat diagram, explain VSAT's is networks and VSAT topologies **(10 Marks)**
b. Briefly discuss the satellite cable television and direct broadcasting with the help of neat diagram. **(10 Marks)**

Module-5

9 a. Classify the satellite. Remote sensing system on the basis of radiation and spectral region used for data acquisition and explain any two methods. **(10 Marks)**
b. Explain the working principle of GPS system. **(10 Marks)**

OR

10 a. Mention the applications of weather forecasting satellites. **(06 Marks)**
b. Discuss the types of images and classify the images. **(08 Marks)**
c. What are the military and civilian applications of satellite navigation system? **(06 Marks)**

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18EC744

Seventh Semester B.E. Degree Examination, June/July 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. Explain the various types of attacks on encrypted messages. **(08 Marks)**

b. List the rules of playfair cipher and encrypt the message "Cryptosystem" with the key "MATRIX". **(08 Marks)**

c. Find the GCD of (24146, 16762) using Euclidean algorithm. **(04 Marks)**

OR

2 a. Explain the functionality of symmetric cryptosystem model with a neat diagram. **(08 Marks)**

b. Determine the inverse mod 26 matrix of

i) $\begin{pmatrix} 6 & 24 & 1 \\ 13 & 16 & 10 \\ 20 & 17 & 15 \end{pmatrix}$ ii) $\begin{pmatrix} 1 & 7 & 22 \\ 4 & 9 & 2 \\ 1 & 2 & 5 \end{pmatrix}$

(12 Marks)

Module-2

3 a. Explain the Feistel Cipher structure with the help of a neat diagram. **(10 Marks)**

b. Explain AES key expansion process with a neat diagram and algorithm. **(10 Marks)**

OR

4 a. Explain the AES encryption one round operation with a neat diagram. **(10 Marks)**

b. Explain the DES encryption algorithm structure with a neat diagram. **(10 Marks)**

Module-3

5 a. Find discrete logarithms for the set {1, 2,.....12} with the base 6 modulo 13. **(12 Marks)**

b. Find the multiplicative inverse in GF (ϕ = 1997) of the following: i) 543 ii) 894. **(08 Marks)**

OR

6 a. State the properties that are to be satisfied by a set S, to become a field. **(12 Marks)**

b. It can be shown that if gcd(m, n) = 1 then $\phi(m, n) = \phi(m)\phi(n)$. Also, if P is a prime then $\phi(p) = (p - 1)$, determine number of relatively prime numbers in i) ϕ (26100) ii) ϕ (27783). **(08 Marks)**

Module-4

7 a. Explain the encryption and decryption process of RSA algorithm. Also encrypt the message M = 5 such that p = 11, q = 19 and e = 13. **(12 Marks)**

b. Explain the encryption and decryption process of Elliptic curve cryptography. **(08 Marks)**

OR

8 a. In the elliptic curve group $E_{23}(1, 1)$, consider the points P = (3, 10) and Q = (9, 7). Find the points 2P and P + Q. **(12 Marks)**

b. Explain the Diffie-Hellman key exchange algorithm. Also find the shared key for q = 199, $\alpha = 7$, $X_A = 8$ and $X_B = 13$. **(08 Marks)**

Module-5

9 a. Explain the operation of LFSR in brief. Using a 4-bit LFSR tapped at the 1st and 4th bit, and with initial condition 1111, generate the output sequence. Determine after how many iterations the sequence repeats. **(10 Marks)**

b. Explain the operation of the following generators :

i) Beth-Piper stop-and-go generator

ii) Alternate stop-and-go generator. **(10 Marks)**

OR

10 a. Explain the operation of Gifford generator with a neat diagram. **(08 Marks)**

b. Explain the operation of the following generators

i) Fish generator

ii) Algorithm M. **(12 Marks)**

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