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18EC71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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. What is Physical Topology? With a neat diagram, explain the various types of physical topologies available in computer networks. **(10 Marks)**

b. With a neat diagram, explain the significance of layers in TCP/IP protocol suite. **(10 Marks)**

OR

2 a. Explain LAN and WAN with the help of neat diagrams. **(06 Marks)**

b. With a neat diagram, explain the five components of Data Communication. **(06 Marks)**

c. Explain encapsulation and decapsulation in TCP/IP model with the help of a neat diagram. **(08 Marks)**

Module-2

3 a. What is an ARP? Explain the operation of ARP and its packet format with suitable diagrams. **(10 Marks)**

b. Explain stop and wait protocol with a neat FSM diagram. Also explain how sequence and acknowledge numbers prevent duplication of frames with necessary diagrams. **(10 Marks)**

OR

4 a. A slotted ALOHA network transmits 200 bit frames using a shared channel with a 200 kbps bandwidth. Find the throughput if the system produces
(i) 1000 frames per second (ii) 500 frames per second (iii) 250 frames per second? **(06 Marks)**

b. Explain CSMA/CA protocol with a flow diagram. **(08 Marks)**

c. Explain the Ethernet Frame format of standard Ethernet. **(06 Marks)**

Module-3

5 a. Explain with a neat diagram, the virtual circuit packet switched network and its various phases of operation. **(10 Marks)**

b. With a neat diagram explain IPv4 Datagram format. **(10 Marks)**

OR

6 a. Explain with an example, the Distance Vector Routing algorithm. **(10 Marks)**

b. Explain with an example, Link State Routing and also apply Dijkstra algorithm to find least cost path tree. **(10 Marks)**

Module-4

7 a. Explain connectionless and connection oriented protocols in transport layer. **(10 Marks)**

b. With a neat diagram, explain state transition diagram of TCP. **(10 Marks)**

OR

8 a. Explain Go-Back-N protocol along with sliding window diagrams. **(10 Marks)**
b. Explain TCP connection establishment using three way hand shaking. **(10 Marks)**

Module-5

9 a. Explain World Wide Web and Web documents with necessary diagrams. **(10 Marks)**
b. Explain the Architecture of Electronic mail with a neat diagram. **(10 Marks)**

OR

10 a. Explain with an example, the working of Hyper Text Transfer Protocol. **(10 Marks)**
b. What is Name-address resolution? With a neat diagram, explain the various types of resolution that are available. **(10 Marks)**

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18EC72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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. With neat graph define Moore's law. Explain the history of integrated structures. **(06 Marks)**

b. Realize CMOS logic structure for the Boolean expressions :

i) $y = \overline{(a \cdot b) + (c \cdot d)}$ ii) $y = a \cdot (b + c)$. **(06 Marks)**

c. With neat diagrams, explain 3 regions of operations of nMOS transistor. **(08 Marks)**

OR

2 a. List the any three non ideal features of transistors. Explain each in detail. **(06 Marks)**

b. Draw the diagram of general logic gate structure. Explain 2-input CMOS NAND gate functioning using truth table. **(06 Marks)**

c. Draw schematic diagram of CMOS inverter. Explain the graphical derivation of CMOS inverter DC characteristics. **(08 Marks)**

Module-2

3 a. With neat diagrams, explain the complete CMOS fabrication process. **(12 Marks)**

b. Using relevant equations explain full scaling (constant field scaling) applied to i) Channel length ii) Channel depth iii) Oxide thickness iv) Junction depth v) Supply vi) Threshold voltage vii) Doping densities N_A, N_D. **(08 Marks)**

OR

4 a. Write a short note on timing analyzer. **(06 Marks)**

b. With neat diagrams, explain the lumped representation of parasitic MOSFET capacitances. **(08 Marks)**

c. Draw and explain layout rules for transistors. **(06 Marks)**

Module-3

5 a. Explain various stages of timing optimization in VLSI design. **(08 Marks)**

b. With equations explain the calculation of inverter delay. **(06 Marks)**

c. Estimate the propagation delay t_{pd} for unit inverter driving 'm' identical unit inverters using Elmore delay. **(06 Marks)**

OR

6 a. Draw the diagram of photo masking with a negative resist and explain. **(08 Marks)**

b. What is logical effort? Explain HI-Skew inverter construction by down sizing of nMOS transistor. **(06 Marks)**

c. Explain pseudo nMOS inverter with schematic diagram and DC transfer characteristics. **(06 Marks)**

Module-4

7 a. Draw and explain the functioning of pulse generators. (08 Marks)

b. Explain the working of resettable flip-flops and latches. (12 Marks)

OR

8 a. Draw and explain the features of C^2MOS latch. (08 Marks)

b. With neat circuit diagrams, explain 4 transparent latches. Write the advantage and disadvantage of each. (12 Marks)

Module-5

9 a. Draw the diagram of 4 bit × 4 bit NOR based ROM array, explain the functioning. (08 Marks)

b. What is static RAM? With neat diagram explain any 3 static RAM circuits. (12 Marks)

OR

10 a. Write a short note on design for testability. (06 Marks)

b. Explain manufacturing test principles in detail. (06 Marks)

c. Explain the logic verification principles. (08 Marks)

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18EC732

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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 the Kepler's laws of planetary motion with neat diagrams and necessary equations. **(10 Marks)**

b. Explain phenomenon earth ellipse of satellite. **(06 Marks)**

c. The elliptical orbit of a satellite has its semi-major axis and semi-minor axis as 25000 km and 1833 km respectively. Determine the apogee and perigee distances. **(04 Marks)**

OR

2 a. Explain injection velocity and resulting satellite trajectories with supporting expression. **(09 Marks)**

b. Describe different types of satellite orbits with respect to the orientation of the orbital plane. **(07 Marks)**

c. Explain Azimuth and Elevation angle. **(04 Marks)**

Module-2

3 a. Explain basic block schematic arrangement of a regulated bus power supply system. **(08 Marks)**

b. Explain telemetry, tracking and command subsystem with block diagram. **(08 Marks)**

c. Define fixed satellite earth station and mobile satellite service earth station. **(04 Marks)**

OR

4 a. Explain earth station architecture with generalized earth station block diagram. **(10 Marks)**

b. Explain three tracking techniques used for satellite tracking. **(10 Marks)**

Module-3

5 a. Derive expression for transmission equation. **(08 Marks)**

b. Explain TDMA typical frame structure. **(08 Marks)**

c. Mention the advantages of TDMA over FDMA. **(04 Marks)**

OR

6 a. Discuss the parameters influence the design of satellite communication link. **(09 Marks)**

b. Explain demand assigned FDMA and pre-assigned FDMA. **(05 Marks)**

c. Explain SDMA/FDMA system and SDMA/TDMA with neat diagram. **(06 Marks)**

Module-4

7 a. Mention the advantages and disadvantages of satellite over terrestrial networks. **(08 Marks)**

b. Explain with neat block diagram, satellite point to point telephone networks. **(08 Marks)**

c. Explain communication related application of satellite. **(04 Marks)**

OR

8	a.	Explain satellite telephony.	**(08 Marks)**
	b.	Explain with neat block diagram bent or transparent transponder.	**(08 Marks)**
	c.	Explain the bands of satellite communication.	**(04 Marks)**

Module-5

9	a.	Explain GPS satellite system structure.	**(08 Marks)**
	b.	What is remote sensing satellite network? What are its applications?	**(08 Marks)**
	c.	Explain brief weather forecasting satellite orbits.	**(04 Marks)**

OR

10	a.	Classify the sensors used in remote sensing satellites.	**(08 Marks)**
	b.	What are the applications of satellite navigation systems?	**(04 Marks)**
	c.	Explain optical, thermal and microwave remote sensing systems.	**(08 Marks)**

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18EC744

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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 and explain the model of symmetric cryptosystem. **(06 Marks)**

b. Encrypt the plaintext 'paymoremoney' using Hill chipher.

$$K = \begin{bmatrix} 17 & 17 & 15 \\ 21 & 18 & 21 \\ 2 & 2 & 19 \end{bmatrix}$$ **(08 Marks)**

c. Encrypt the plaintext 'electronics and communication' using playfair cipher. Use the keyword 'VTUBGM'. **(06 Marks)**

OR

2 a. Find the GCD of 1160718174, 316258250 using Euclidian algorithm. **(08 Marks)**

b. Construct the Addition and Multiplication tables under Modulo 8 and write the table of additive and multiplication inverse module 8. **(07 Marks)**

c. Define the residue class under Mod n (z_n) write the residue class of Mod 4. **(05 Marks)**

Module-2

3 a. Draw and explain the Fiestel structure for encryption and decryption. **(12 Marks)**

b. With the help of neat figure, explain the DES encryption algorithm. **(08 Marks)**

OR

4 a. With the help of neat figure, explain the AES encryption process. **(12 Marks)**

b. With the help of neat figure, explain the AES key expansion. **(08 Marks)**

Module-3

5 a. Define Abelian group by mentioning the axioms. **(05 Marks)**

b. Perform addition, subtraction, multiplication and division on the polynomials $f(x) = x^3 + x^2 + 2$ and $g(x) = x^2 - x + 1$. **(08 Marks)**

c. Construct addition and multiplication tables in GF(7). Also write the table of additive and multiplicative inverses. **(07 Marks)**

OR

6 a. Define:
i) Prime Numbers
ii) Relatively Prime Numbers.
Give one example for each. **(04 Marks)**

b. State Fermat's theorem and Euler's theorem. Give one example for each. **(08 Marks)**

c. Explain Euler's Totient Function. Find the values of $\phi(37)$ and $\phi(35)$. **(08 Marks)**

Module-4

7 a. Explain the requirements of Public-key cryptography. **(06 Marks)**

b. Explain the RSA algorithm. **(06 Marks)**

c. Assuming p = 17, q = 11, find the public key and private keys. Perform encryption and decryption for plaintext message block M = 88. **(08 Marks)**

OR

8 a. Explain the Diffie-Hellman key exchange algorithm. Show that the keys generated at sender side and receiver side are same. **(08 Marks)**

b. Explain the Man-in-the-middle attack. **(08 Marks)**

c. Define primitive root. Give an example. **(04 Marks)**

Module-5

9 a. Explain the linear congruential generators. **(05 Marks)**

b. With a neat figure, explain the generalized Geffe generator. **(07 Marks)**

c. With neat figures explain

i) Beth-piper stop and go generator

ii) Alternating stop and go generator. **(08 Marks)**

OR

10 a. With neat figure, explain bilateral stop and go generator. **(08 Marks)**

b. Explain Giffort algorithm with relevant diagram. **(06 Marks)**

c. Explain Fish, Pike algorithms with relevant equations. **(06 Marks)**

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18EC745

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
Machine Learning With Python

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Discuss the four distinct program modules that represent the central in many learning system. **(10 Marks)**

b. Discuss the basic issue and approaches to ML are illustrated by designing a program to learn to play checkers, with the goal of entering it in the world checkers tourment. **(10 Marks)**

OR

2 a. Discuss the unbiased learner. **(10 Marks)**

b. Write a Find-S algorithm and to illustrate this algorithm, the learner is given the sequence of training examples from the Enjoy sport task.

Ex	Sky	Air temp	Humidity	Wind	Water	Forecast	Enjoy sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Cold	Change	Yes

(10 Marks)

Module-2

3 a. Write basic ID3 algorithm which learns decision tree by constructing them top – down. **(10 Marks)**

b. Give decision tree to represent the following Boolean function

i) $A \wedge \neg B$

ii) $A \vee (B \wedge C)$

iii) A XOR B

iv) $(A \wedge B) \vee (C \wedge D)$. **(10 Marks)**

OR

4 a. Discuss the appropriate problems for decision tree learning. **(10 Marks)**

b. For the transaction shown in the table compute the following :

i) Entropy of the collection of transaction records of the table with respect to classification

ii) What are the information gain of a_1 and a_2 relative to the transaction of the table?

Instance	1	2	3	4	5	6	7	8	9
a_1	T	T	T	F	F	F	F	T	F
a_2	T	T	F	F	T	T	F	F	T
Target class	+	+	–	+	–	–	–	+	–

(10 Marks)

Module-3

5 a. How to calculate the gradient at each step using training rule for gradient descent. (10 Marks)

b. Explain the stochastic approximation to gradient descent. (10 Marks)

OR

6 a. Write the Back propagation algorithm. (10 Marks)

b. Derive the training rule for hidden unit weights. (10 Marks)

Module-4

7 a. Discuss the features of Bayesian learning methods. (10 Marks)

b. Explain the terms :

i) Maximum a posterior (MAD) Hypothesis

ii) Maximum a likelihood (ML) Hypothesis (10 Marks)

OR

8 a. What criterion should be optimized in order to find maximum likelihood hypothesis (10 Marks)

b. The following table gives data set, at using naïve bayes classifier classify the new data (Sunny, Cool, high, Strong)

Day	Outlook	Temperature	Humidity	Wind	Play tennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

(10 Marks)

Module-5

9 a. Write the K-Nearest Neighbor algorithm for approximation a discrete valued target function and also real values target function. (10 Marks)

b. Explain the ANN learning with radial basis functions. (10 Marks)

OR

10 a. Write the algorithm for Q-learning algorithm. (07 Marks)

b. The dates sample S contains n = 40 examples and that hypothesis h commits r = 12 errors over this data, with the 68% confidence interval estimate for $error_D(h)$ with $Z_N = 1$. (07 Marks)

c. Write the comparing learning algorithm. (06 Marks)

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18TE71

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a neat block diagram, explain the optical fiber communication system and digital optical fiber link. **(06 Marks)**

b. Explain 'Total internal reflection' and 'Acceptance angle' as relevant to ray theory transmission in optical fibers with relevant sketches. **(10 Marks)**

c. A silica optical fiber with a core diameter large enough to be considered by ray theory has refractive index of 1.50 and a cladding refractive index of 1.47. Determine :
i) The critical angle at the core – cladding interface
ii) The numerical aperture for the fiber
iii) The acceptance angle in air for the fiber. **(04 Marks)**

OR

2 a. Sketch out the refractive index profiles of step index fibers and Graded index fibers and explain the process of ray transmission of both of them. **(10 Marks)**

b. Give a brief note on the following :
i) Cut – off wavelength
ii) Mode – field diameter and spot size
iii) Effective refractive index for the operation through single mode fiber. **(06 Marks)**

c. A multimode step index fiber with core diameter of 80μm and relative index difference of 1.5% is operating at a wavelength of 0.85μm. If core refractive index is 1.48, estimate :
i) The normalized frequency for the fiber
ii) The number of guided modes. **(04 Marks)**

Module-2

3 a. Describe the process of linear scattering losses and non-linear scattering losses of optical fibers. **(10 Marks)**

b. What are fiber splices and connectors? Explain each with an example and relevant figures. **(06 Marks)**

c. A 6km optical link consists of multimode step index fiber with a core refractive index of 1.5 and a relative refractive 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. **(04 Marks)**

OR

4 a. Discuss the mechanisms of dispersion and chromatic dispersion with net sketches. **(10 Marks)**

b. What are Fiber couplers? Describe the classification and types of fiber optical couplers with relevant diagram. **(06 Marks)**

c. A 4-port multimode fiber FBT coupler has 60μW optical power launched into port 1. The measured output powers at ports 2, 3 and 4 are 0.004, 26.0 and 27.5μW respectively. Determine the excess loss, the insertion losses between the input and output ports, the cross talk and the split ratio for the device. **(04 Marks)**

Module-3

5 a. Explain with a neat block schematic the operation of surface and edge emitting double heterojunction LED. **(10 Marks)**

b. Discuss on the quantum efficiency to LED power with relevant equations. **(06 Marks)**

c. A double – heterojunction InGaAsP LED emitting at a peak wavelength of 1310nm has radiactive and non radiactive recombination times of 30 and 100ns, respectively. The derive current is 40ma. Find :

i) The bulk recombination time

ii) Internal quantum efficiency and internal power level. **(04 Marks)**

OR

6 a. With a neat diagram, explain Fabry –Perot resonator cavity and distributed – feedback (DFB) of laser diode. **(10 Marks)**

b. Explain the three basic optical – confinement methods used for bounding laser light with sketches. **(06 Marks)**

c. Problem : A GaAs laser operating at 850nm has a 500μm length and a refractive index n = 3.7.

i) What are the frequency spacing and the wavelength spacing?

ii) If at the half – power point, $\lambda - \lambda_0 = 2$nm, what is the spectral width σ of the gain? **(04 Marks)**

Module-4

7 a. What is WDM? With a neat schematic diagram of WDM network and also sketch of transmission band widths explain the operating principles of WDM. **(10 Marks)**

b. Discuss on the process of light passing through isolators and circulators with diagrams. **(10 Marks)**

OR

8 a. Briefly explain the DWDM technology based on diffraction gratings and MEMS technology of active components of optical fiber technology with relevant figures. **(10 Marks)**

b. With a neat block diagram, discuss the amplification system of Raman amplifiers and Wide band optical amplifiers. **(10 Marks)**

Module-5

9 a. Explain with neat sketches the functions of optical networking node elements and optical cross–connect (oxc). **(10 Marks)**

b. Give a brief note on optical packet switched networks and optical burst switching networks with a neat diagram. **(10 Marks)**

OR

10 a. Briefly explain the internet protocol over physical layer evolution and traffic flow patterns for optical communication. **(10 Marks)**

b. Write short notes on the following :

i) Metropolitan area networks

ii) Local area networks. **(10 Marks)**

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Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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. Derive expression for received E –field and path loss for the tow-ray model. **(10 Marks)**

b. Consider the geometry shown in Fig.Q1(b). Determine :
i) The loss due to knife-edge diffraction
ii) The height of the obstacle required to induced 6dB diffraction loss. Assume f – 900MHz.

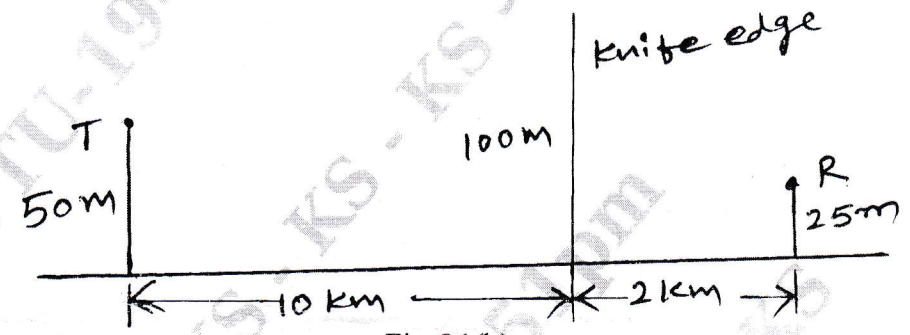

Fig.Q1(b) **(06 Marks)**

c. Transmitter produces 50Watts of power and is applied to a unity gain antenna with a 900MHz carrier frequency. Find the received power in dBm at a free space distance of 100m from the antenna. What is P_r(10km)? Assume unity gain for the receiver antenna. **(04 Marks)**

OR

2 a. Describe the three basic propagation mechanisms which impact propagation in a mobile communication system. **(06 Marks)**

b. Explain the following :
i) Log – distance path loss model
ii) Okumura model. **(08 Marks)**

c. Assume a receiver is located 10km from a 50W transmitter. The carrier frequency as 900MHz, free space propagation is assumed, $G_t = 1$ and $G_r = 2$. Find :
i) The power at the receiver
ii) The magnitude of E – field at the receiver antenna
iii) The rms voltage applied to the receiver input assuming that the receiver antenna has a purely real impedance of 50Ω and is matched to the receiver. **(06 Marks)**

Module-2

3 a. Explain the factors influencing small-scale fading. **(04 Marks)**

b. Describe an impulse response model of a multipath channel. **(08 Marks)**

c. If a signal to interference ratio of 15dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is
i) n = 4 ii) n = 3? Assume that there are 6 co-channel cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations. **(08 Marks)**

OR

4 a. Illustrate the concept of cellular frequency reuse. **(06 Marks)**

b. Describe hand off strategies used in cellular ratio system. **(06 Marks)**

c. A hexagonal cell within a 4-cell system has a radius of 1.387km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs, and λ = 1 call/hour, compute the following for an Erlang C system that has a 5% probability of a delayed call;

i) How many users per square kilometer will this system support?

ii) What is the probability that a delayed call will have to wait for more than 10s?

iii) What is the probability that a call will be delayed for more than 10 seconds?

Assume : for c = 15, traffic intensity = 9.0 Erlangs. **(08 Marks)**

Module-3

5 a. Explain the features of TDMA and FDMA. **(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, find :

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 must wait between two simultaneous transmissions. **(08 Marks)**

OR

6 a. With neat diagram, explain micro cell zone concept. **(06 Marks)**

b. Describe space division multiple access. **(06 Marks)**

c. Explain pure ALOHA and slotted ALOHA. **(08 Marks)**

Module-4

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

b. Illustrate the role of different burst used in GSM system. **(10 Marks)**

OR

8 a. Explain different types of logical channels used in GSM. **(10 Marks)**

b. With neat block diagram, explain the process of handover between two cells belonging to different BSCS which are associated with two different MSCS. **(10 Marks)**

Module-5

9 a. With neat block diagram, explain IS – 95 mobile station transmitter. **(10 Marks)**

b. Explain power control mechanism used in CDMA cellular system. **(06 Marks)**

c. Explain long and short spreading codes used in IS – 95 system. **(04 Marks)**

OR

10 a. Explain logical and physical channels used in IS – 95 system. **(10 Marks)**

b. With net block diagram, explain IS – 95 down link. **(10 Marks)**

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