

[Time: 3 Hours]

[Marks:80]

Please check whether you have got the right question paper.

- N.B: 1. **Q 1 is compulsory**
 2. **Solve any 3 from remaining**
 3. **Assume suitable data if required**

- Q.1 Solve any four **20**
- a) What is mode jumping and how is it avoided in magnetron
 - b) List microwave frequency bands with frequency range
 - c) Calculate coupling factor of directional coupler when the incident power is 600 mW and power in auxiliary waveguide is 350 mW.
 - d) Explain working of Tunnel diode and its application in microwave engineering.
 - e) Explain microstrip line working with geometry
- Q.2 a) Explain schematic of Reflex klystron & working with applegate diagram. **10**
 b) Explain physical structure and principle of working of TRAPATT diode. **10**
- Q.3 a) An air filled 5 x 2 cm waveguide has $E_2 = 20 \sin(40\pi x) \sin(50\pi y) e^{-j\beta z}$ **10**
 z v/m 15GHz
 1. What is mode of propagation. Justify
 2. Determine wave impedance E_y/H_x
- b) A magnetron has following parameters **10**
 Gnner radius : 0.15 m
 Outer radius : 0.45m
 Flux density of magnetic field B_0 : 1.2 Wb/m²
 1. Determine Hull cut off voltage
 2. Cut off magnetic field density when beano voltage $V_0 = 6000V$
 3. Cyclotron frequency in GHz if $B = 0.3 \text{ Wb/ m}^2$
- Q.4 a) A 50Ω transmission line is terminated on a load of $73 - j80\Omega$. Design **10**
 single stub matching impedance matching using short circuited shunt stub
 b) Explain any two methods of power measurement. **10**
- Q.5 a) Construct a four port circulator using two magic Tees & a gyrator. Explain **10**
 working of same at all four parts.
 b) Discuss working of Faraday Rotation isolator from port 1 to port 2 & port 2 **10**
 to port 1 with relevant diagrams.
- Q.6 a) List various modes of oscillation of Gunn diode. Give criteria of **10**
 classification of these modes and explain working of any one mode.
 b) Derive field equations for TE modes in rectangular waveguides. What are **10**
 degenerate modes?

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Max. Marks: 80

- N.B. : (1) Question No.1 is compulsory
 (2) Write any three questions from Q. 2 to Q.6.
 (3) Draw neat diagrams wherever necessary.
 (4) Assume suitable data, if required and state it clearly.

- Q1 Solve any five**
- a Compare GSM and GPRS 4
 - b What is Doppler frequency shift?. Derive an expression for it 4
 - c Explain why OFDMA is preferred for downlink and SC-FDMA for uplink in LTE 4
 - d Explain soft and hard handoff with a neat diagram 4
 - e What is SDR? State its advantages 4
 - f List the specifications of 5G 4
- Q2**
- a Explain GSM Network Architecture with neat diagram 10
 - b In a cellular system with frequency reuse distance of 7 and the mobile receiver located at the boundary of its operating cell, under the influence of interfering cells in the first tier. Compute the S/I ratio at mobile receiver for:
 - i) omnidirectional antenna design
 - ii) 3 sector 120° directional antenna design
 - iii) 6 sector 60° directional antenna design
 comment on the effect of sectoring on S/I ratio.
 Consider path loss exponent of 3. 10
- Q3**
- a Compare 1G, 2G, 3G, 4G and 5G with respect to speed, applications, bandwidth, spectral efficiency and handoff. 10
 - b Compare IS-95, CDMA-2000 and WCDMA 10
- Q4**
- a What is MIMO? What are its advantages. Explain MIMO with respect to 4G Technology. 10
 - b Draw LTE network architecture and Discuss in details. 10
- Q5**
- a Explain multi-path signal propagation and RAKE receiver in detail 10
 - b Draw a neat diagram of UMTS system architecture showing all interfaces and explain in details. 10
- Q6 Write a short note on (Solve any 2)** 20
- a Two Ray ground reflection Model
 - b Traffic Theory with respect to mobile cellular networks
 - c Orthogonal Frequency Division Multiple Access

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- N.B. : (1) Question No 1 is Compulsory.
 (2) Attempt any three questions out of the remaining five.
 (3) All questions carry equal marks.
 (4) Assume suitable data, if required and state it clearly.

- 1 Attempt any FOUR [20]
 A What is Big Data? What is Hadoop? How are Big Data and Hadoop linked?
 B Write the step of Grivan-Newman algorithm. Explain clustering of Social Network Graph using GN algorithm with example.
 C What is MapReduce ? Explain How Map and Reduce Work?
 D Explain PCY algorithm with suitable examples.
 E Explain NoSQL data Architecture patterns.
 F Explain Recommendation system & its various types with example.
- 2 a Describe the structure of HDFS in a Hadoop Ecosystem using a diagram [10]
 b What is NOSQL? What are the business drivers for NoSQL? Discuss any two architectural patterns of NoSQL. [10]
- 3 a Explain Page Rank with Example. Can a Website's Page rank Ever Increase? What are its chances of Decreasing? [10]
 b Evaluate PCY algorithm on the following transaction to find the candidate sets (frequent sets). [10]
 Given data: Threshold value or minimization value = 3
 Hush function = $(i * j) \bmod 10$.
 T1 = {1, 2, 3} T2 = {2, 3, 4} T3 = {3, 4, 5}
 T4 = {4, 5, 6} T5 = {1, 3, 5} T6 = {2, 4, 6}
 T7 = {1, 3, 4} T8 = {2, 4, 5} T9 = {3, 4, 6}
 T10 = {1, 2, 4} T11 = {2, 3, 5} T12 = {3, 4, 6}
- 4 a Explain the Role and effect of damping Factor(teleportation) in page rank computation [10]
 b Calculate the Cosine distance measure for given vectors [10]
 $d_1 = 3\ 2\ 0\ 5\ 0\ 0\ 0\ 2\ 0\ 0$
 $d_2 = 1\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 2$
- 5 a Explain Clearly with diagram how the PCY algorithm helps to perform frequent itemset mining for large datasets [10]
 b Give the formal definition of Nearest Neighbor problem, Show how finding plagiarism in a document is nearest Neighbour Problem. What similarity measure can be used [10]
- 6 a Given a Dim Dataset {1,5,8,10,2} Use the agglomerative clustering algorithm with Euclidean distance to establish hierarchical grouping relationship. Draw the dendrogram. [10]
 b Write a note on (Any Two) [10]
 i) HITS
 ii) Distance measurement for Big data
 iii) Multistage Frequent Itemset Mining Algorithm

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- 1 Attempt any **FOUR** **[20]**
- a What is Software Defined Networking (SDN)?
 - b Explain the Real Time Transport Control Protocol (RTCP) message types.
 - c Describe each field of Secure Shell (SSH) packet format with diagram.
 - d Explain Virtual Private Network in brief with diagram.
 - e Compare OSI and TCP/IP protocol suite.
- 2 a Explain concepts of device provisioning, data collection, migration and configuration management with respect to network automation. **[10]**
- b What are the steps involved in image compression using JPEG standard. **[10]**
- 3 a What is a firewall? Explain packet filter and proxy firewall with necessary diagrams. **[10]**
- b Explain IoT protocol layer diagram with protocols at each layer. **[10]**
- 4 a Describe each field of Real Time Transport Protocol (RTP) packet header format with diagram? **[10]**
- b Explain DHCP packet format with diagram. **[10]**
- 5 a Explain query and response messages in DNS with header format. **[10]**
- b Explain Differentiated Services (DS) with respect to Quality of Service (QoS). Explain DS field, per-hop behavior and traffic conditioner with respect to DS. **[10]**
- 6 a What is Voice over IP? Explain messages and address formats of Session Initiation Protocol (SIP)? How a simple session of VOIP happen using SIP? **[10]**
- b Explain Pretty Good Privacy (PGP) protocol with respect to application layer security. **[10]**

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- 1 Attempt any FOUR [20]**
- a Differentiate between cybercrime and cyber fraud.
 - b Explain various threats associated with cloud computing.
 - c Explain methods of password cracking
 - d Explain E-contracts and its different types.
 - e Explain different attack vectors in cyber security
- 2 a Explain the classification of cybercrimes with examples. [10]**
b Explain various types of credit card frauds [10]
- 3 a Explain different buffer overflow attacks also explain how to mitigate buffer overflow attack [10]**
b Explain electronic banking in India and what are laws related to electronic banking in India [10]
- 4 a What do you understand by DOS and DDOS attack? Explain in detail. [10]**
b Write a note on Intellectual Property Aspects in cyber law. [10]
- 5 a Explain the objectives and features of IT Act 2000 [10]**
b What are Botnets? How it is exploit by attacker to cause cyber attack? [10]
- 6 a Explain SQL injection attack. State different countermeasure to prevent the attack. [10]**
b Explain what is Information Security Standard and Explain HIPAA act in detail [10]
