

[Time:3 Hours ]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Each question carries 20 marks.
  2. Question no.1 is compulsory.
  3. Solve any 3 out of remaining
  4. Assume suitable data wherever required.

- Q.1 Solve any four 20
- a) Load impedance  $Z_L = 50 + j150\Omega$  and characteristics impedance  $Z_0 = 50\Omega$ , calculate reflection coefficient and VSWR
  - b) List microwave frequency bands with frequency range and state applications of any two bands
  - c) Explain working principal of TUNNEL diode.
  - d) Show that for a  $TE_{10}$  mode a frequency of 6 GHz will pass through the waveguide if a dielectric with relative permittivity of 4 is inserted into the waveguide. The dimensions are  $a = 1.5\text{cm}$  and  $b = 1\text{cm}$
  - e) Explain Applegate diagram of Reflex Klystron.
- Q.2 A Explain Two cavities Klystron with schematic diagram. Explain bunching process with the help of Applegate diagram. 10
- B Explain physical structure and principal of operation of IMPATT diode 10
- Q.3 A A rectangular waveguide has width  $a = 22.86\text{mm}$  and height  $b = 10.16\text{mm}$ . Calculate the cut-off frequency and cut-off wavelength of the first four mode. 10
- B A travelling wave tube (TWT) has the following characteristics: 10
- Beam Voltage  $V_0 = 2\text{KV}$ , Beam current  $I_0 = 4\text{mA}$ , frequency  $f = 8\text{GHz}$ ,  
Circuit length  $N = 50$ , Characteristics impedance  $Z_0 = 20\Omega$ .  
Determine
- a) Gain parameter 2
  - b) The power gain in decibels 2
  - c) All four propagation constants 6
- Q.4 A  $50\Omega$  transmission line is connected to a cellular phone antenna with load Impedance  $Z_L = 25 - j50\Omega$ . Find the position and the length of a shunt short circuit stub required to match the  $50\Omega$  line. 10
- B Describe working principle of phase shifter with neat diagram. 10
- Q.5 A Explain E-plane Tee and H-plane Tee with their properties. 10
- B Explain methods of microwave frequency measurement 10
- Q.6 A Explain any two methods of measuring impedance of a terminating load in Microwave system. 10
- B a) Explain Two Valley Model Theory in Gunn diode. 5
- b) Describe Varactor diode working principle. 5

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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 a neat diagrams wherever necessary.

- Q1 Solve any five**
- a** Draw GSM Network Architecture and explain the use of the following: 1) Home location register (HLR) 2) Visitor location register (VLR) 3) Equipment Identity register (EIR) and 4) Authentication center (AUC) **4**
- b** Determine the maximum speed of a vehicle in a mobile communication system experiencing a maximum Doppler frequency shift of 70 Hz and a frequency of transmission 900 MHz. **4**
- c** Explain why OFDMA is preferred for downlink and SC-FDMA for uplink in LTE **4**
- d** List the features of 5G **4**
- e** What is Cognitive Radio? State its advantages **4**
- f** List the various types of handoffs. Explain Mobile assisted handoff, soft handoff and hard handoff. **4**
- Q2 a** Explain Orthogonal Frequency Division Multiple Access (OFDMA) with neat diagrams. Also state its advantages and drawbacks. **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 4. **10**
- Q3 a** Explain Traffic Theory with respect to mobile cellular networks **10**
- b** Compare IS-95, CDMA-2000 and WCDMA **10**
- Q4 a** Draw LTE network architecture and Discuss in details. **10**
- b** Draw a neat diagram of UMTS system architecture and explain in details. **10**
- Q5 a** What is MIMO? What are its advantages. Explain MIMO with respect to 4G Technology. **10**
- b** Consider that a geographical service area of a cellular system is 4200 km<sup>2</sup>. A total of 1001 radio channels are available for handling traffic. Suppose the area of cell is 12 km<sup>2</sup>. 1) How many times would the cluster of size 7 have to be replicated in order to cover the entire service area? Calculate the number of channels per cell and the system capacity. 2) If the cluster size is decreased from 7 to 4, then does it result into increase in system capacity? Comment on the results obtained. **10**
- Q6 a** Compare 1G, 2G, 3G, 4G and 5G w.r.t speed, applications, bandwidth, spectral efficiency and handoff. **10**
- b** Explain Friis Free Space Propagation Model. Derive an expression for received power and path loss at a distance 'd' from Mobile transmitter using Free space model. State advantages and drawbacks of the Model. **10**

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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 are the characteristics of big Data?
- b Explain Hadoop Architecture Model.
- c Explain NoSQL data Architecture patterns.
- d Explain Matrix Vector Multiplication algorithm by MapReduce
- e How recommendation is done based on properties of the product? Explain with suitable example

**2 a What is MapReduce ? Explain How Map and Reduce Work? What is Shuffling in MapReduce? [10]**

**b Why is finding similarity important in BigData? Illustrate using two example application [10]**

**3 a Explain Page Rank with Example. Can a Website's Page rank Ever Increase? What are its chances of Decreasing? [10]**

**b For given database D; Minimum support =2 use PCY algorithm to get frequent itemset [10]**

TID	Items
1	1,2,3
2	2,3,5
3	1,2,3,5
4	2,5

**4 a Explain the Data Stream Management system with neat diagram [10]**

**b 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]**

5 a Calculate the Cosine distance measure for given vectors [10]

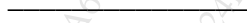
$$d_1 = 3205000200$$

$$d_2 = 1000000102$$

b Explain the concept of Bloom's filter with the helper examples [10]

6 a Explain short note on [20]

- a) Zookeeper
- b) CAP theorem
- c) Clustering Algorithms
- d) Market basket model



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- 1 Attempt any **FOUR** [20]  
a Explain Open flow protocol.  
b Write a short note on IPTV.  
c Compare OSI and TCP/IP protocol suite.  
d Explain Virtual Private Network in brief with diagram.  
e What are the packet scheduling disciplines on the Internet?
- 2 a Explain DHCP packet format with diagram. [10]  
b Explain H.261 video compression standard. [10]
- 3 a What is a firewall? Explain packet filter and proxy firewall with necessary diagrams. [10]  
b Define IoT. Explain IoT protocol layer diagram with protocols at each layer. [10]
- 4 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 concepts of device provisioning, data collection, migration and configuration management with respect to network automation. [10]
- 5 a Explain MPEG 2 standard. [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 Describe each field of Real Time Transport Protocol (RTP) packet header format with diagram? [10]  
b Explain S/MIME protocol with respect to application layer security. [10]
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- N.B.:** 1) Question No.1 is **compulsory**.  
2) Attempt any **THREE** questions out of remaining **FIVE** questions.  
3) **Figures** to the **right** indicates **full** marks.  
4) Assume suitable data if **necessary**.

- Q1 Attempt any FOUR of the following 20**
- a List General guidelines for password policies.
  - b Difference between virus and worm.
  - c How cybercrimes differs from most terrestrial crimes?
  - d What are different Security Risks for Organizations?
  - e What are Mobile Vulnerabilities?
- Q.2 10**
- a Discuss steps involved in planning of cyberattacks by criminal. **10**
  - b What is vishing attack? How it works? How to protect from vishing attack? **10**
- Q.3 10**
- a What is e-commerce? Discuss types of e-commerce. **10**
  - b Explain E-contracts and its different types. **10**
- Q.4 10**
- a What are basic security precautions to be taken to safeguard Laptops and Wireless devices? Explain. **10**
  - b What is Cybercrime? Who are Cybercriminals? Explain. **10**
- Q.5 10**
- a What is digital evidence? Where one can find it. **10**
  - b What are illegal activities observed in Cyber Cafe? What are safety and security measures while using the computer in Cyber Cafe? **10**
- Q.6 Write short notes on any FOUR 20**
- a Cyberdefamation
  - b HIPAA
  - c Buffer overflow attack
  - d Steganography
  - e DDOS attack
  - f Trojan horse and backdoor

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