USN ☐☐☐☐☐☐☐☐☐☐ **18EC61**

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Digital Communication

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define HT. State and prove the properties. Mention its applications. **(10 Marks)**
   b. Define signaling format. Sketch the following format using data stream as 111000110:
      (i) Unipolar RZ　　　(ii) Unipolar NRZ　　(iii) Polar NRZ
      (iv) AMI　　　　　　(v) Manchester NRZ **(06 Marks)**
   c. Describe the overview of HDB3 format. **(04 Marks)**

OR

2 a. Explain the pre-envelope of a band pass signals. **(07 Marks)**
   b. Explain complex low pass representation of band pass systems. **(07 Marks)**
   c. Explain canonical representation of band pass signals. **(06 Marks)**

Module-2

3 a. Explain the Gram-Schmidt orthogonalization procedure. **(08 Marks)**
   b. Explain the geometric representation of signals and express the energy of signal interms of the signal vector. **(12 Marks)**

OR

4 a. Explain the matched filter receiver with the neat sketches and mathematical equations. **(08 Marks)**
   b. Explain conversion of continuous AWGN channel into a vector channel. **(07 Marks)**
   c. Describe the complex envelope of a band pass signal. **(05 Marks)**

Module-3

5 a. Define PSK. Derive the probability of error of BPSK. **(10 Marks)**
   b. Describe the QPSK signal with signal space diagram. With a neat diagram, explain the generation and detection of QPSK signal. **(10 Marks)**

OR

6 a. Obtain the expression probability of symbol error of coherent FSK. **(10 Marks)**
   b. Sketch the waveform of QPSK using 1100100001. **(05 Marks)**
   c. Illustrate the operation of DPSK for the binary sequence 10010011. **(05 Marks)**

Module-4

7 a. With a neat diagram, explain the digital PAM transmission through band limited channels. **(08 Marks)**
   b. Explain signal design for band limited signals with controlled ISI (partial response signals). **(12 Marks)**

OR

8 a. With a suitable diagram, explain adaptive equalizing filter. **(10 Marks)**
   b. Describe signal design for band limited channels with zero ISI. **(10 Marks)**

Module-5

9 a. With a neat sketch, explain direct sequence spread spectrum. **(10 Marks)**
   b. Briefly explain the four applications of DS spread spectrum signals. **(10 Marks)**

OR

10 a. With a suitable diagram, explain forward and reverse link of CDMA based IS-95. **(12 Marks)**
   b. A DSSS signal is designed so that the power ratio P_R/P_N at the intended receiver is 10^{-2}. If the desired $E_b/N_o = 10$ for acceptable performance, determine the minimum value of its processing gain. **(03 Marks)**
   c. Illustrate slow frequency hopping. **(05 Marks)**

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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Embedded Systems

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 architecture of ARM cortex – M3 process with the help of neat block diagram.
                                                                            (10 Marks)
   b. Explain Thumb 2 technology.   **(05 Marks)**
   c. Explain ARM Cortex - M3 program status Register in detail.   **(05 Marks)**

OR

2 a. What is stack? Explain the stack operations using PUSH and POP instructions in ARM cortex M3 with the help of neat diagram.   **(06 Marks)**
   b. Explain the operation modes and privilege levels in cortex M3 process with a neat transition diagram.   **(08 Marks)**
   c. Describe the memory map of cortex – M3 with neat diagram.   **(06 Marks)**

Module-2

3 a. Explain the following instruction with example.
      i) ASR   ii) SXTH   iii) RBIT   iv) REV.   **(08 Marks)**
   b. Write on ALP to add two 6h-bit numbers stored in memory.   **(06 Marks)**
   c. Write note on barrier instruction in Cortex M3..   **(06 Marks)**

OR

4 a. Analyse the following instruction and write the contents of the register after the execution of each instruction.   **(08 Marks)**
      Assume $R_8 = 0 \times 00000088$ $R_9 = 0 \times 00000006$ and $R_3 = 0 \times 00001111$
      i)   RSB.W R_8, R_9, # 0×10
      ii) ADD R_8, R_9, R_3
      iii) BIC.W R_6, R_8, # 0×06
      iv) ORR R_8, R_9 **(06 Marks)**
   b. Explain with price of code to load multiple data into register from memory and store the same in another part of memory.
   c. With a diagram, explain the organization of CMSIS and its benefits. **(06 Marks)**

Module-3

5 a. Explain the components of typical embedded system in detail.   **(08 Marks)**
   b. Write the difference between I2C and SPI communication interface   **(06 Marks)**
   c. Explain the sequence of operation of Zigbee and Wi, Fi network.   **(06 Marks)**

OR

6 a. Explain sequence of operation for communicating with I2C slave device. **(08 Marks)**
   b. Write the difference between RISC and CISC processors.   **(06 Marks)**
   c. Compare the operation of Bluetooth and Infrared.   **(06 Marks)**

Module-4

7 a. What is hardware, Software co-design? Explain the fundamental issues in hardware software co-design. **(10 Marks)**

   b. What is non-operational quality attribute? Explain the important non-operational any Embedded system design. **(10 Marks)**

OR

8 a. Explain high level language based embedded firmware development technique. List the advantages of this technique. **(10 Marks)**

   b. What is operational quality attribute? Explain the important operational quality attributes to be considered in any embedded system design. **(10 Marks)**

Module-5

9 a. What is Kernel? What are the different functions handled by real-time Kernel? **(10 Marks)**

   b. Three processes with process IDs P1, P2, P3 with estimated completion time 6, 8, 2 millisecond respectively enter the ready queue together. A new process P4 with estimated complication time 4ms enters the 'Ready' queue after 1ms. Assume all the process contains only CPU operation and no I/O operations are involved. Calculate the waiting time and Turn Around Time (TAT) for each process and the average waiting time and Turn Around Time in the SRT scheduling. **(10 Marks)**

OR

10 a. What is Inter Process Communication (IPC)? Give on overview of any two IPC mechanisms adopted by various operating systems. **(10 Marks)**

   b. Three processes with process IDs P1, P2, P3 with estimated completion time 4, 6, 5 millisecond and priorities 1, 0, 3 (0-highest priority, 3-lowest priority) respectively enter the ready queue together. A new process P4 with estimated completion time 6ms and priority 2 enters the 'Ready' queue after 5ms. Calculate the waiting time and Time and Turn Around Time (TAT) for each process and the average waiting time and Turn Time (Assuming there is no I/O waiting for the processes) in priority – based scheduling algorithm. **(10 Marks)**

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18TE62

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Microwave Theory and Antennas

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Derive the expression for the voltage and current at any point on the transmission line.
   (10 Marks)
   b. Describe the structure and operation of Reflex Klystron oscillator. **(10 Marks)**

OR

2 a. Define reflection co-efficient and derive the expression for reflection co-efficient at load interms of load impedance. **(08 Marks)**
   b. A transmission line has the following parameters $R = 2\Omega/m$, $G = 0.5m$ ohm/m, $f = 1GHz$, $L = 8\eta$, H/m, $C = 0.23pF$. Calculate
   i)   Characteristic impedance (z_0)
   ii) Propagation constant (Γ). **(06 Marks)**
   c. What is standing wave ratio? Write the relationship between SWR and reflection co-efficient. **(06 Marks)**

Module-2

3 a. State and explain the properties of s-matrix. **(10 Marks)**
   b. With neat diagram, illustrate the construction and working of precision type variable attenuator. **(10 Marks)**

OR

4 a. Write the characteristics of Magic Tee. Also obtain scattering matrix for Magic Tee.
   (10 Marks)
   b. Describe the characteristic features of a two hole waveguide directional coupler and derive its s-matrix. **(10 Marks)**

Module-3

5 a. Discuss the operation of micro-striplines, also list the expressions of characteristic impedance, diameter and dielectric constant. **(08 Marks)**
   b. With the aid of schematic diagram, explain co-planar strip lines. **(06 Marks)**
   c. A lossless parallel strip line has a conducting strip width W. The substrate dielectric separating the two conducting strips has a relative dielectric constant $\varepsilon_{rd} = 6$ and a thickness $d = 4mm$, Calculate:
   i)   The width W, with $Z_0 = 50\Omega$
   ii) The strip – line capacitance
   iii) The strip – line inductance. **(06 Marks)**

OR

6 a. Define the following terms with respect to antennas:"
    i)   Radiation intensity
    ii)   Beam efficiency
    iii) Directivity
    iv)   Half power beam width
    v)   Gain.   **(10 Marks)**
   b. Derive the Friis transmission formula.   **(05 Marks)**
   c. Show that maximum effective aperture of a $\lambda/2$ depole antenna is $0.13\lambda^2$.   **(05 Marks)**

Module-4

7 a. Obtain an expression and draw the field pattern for an array of 2 isotropic point sources with same amplitude and phase.   **(10 Marks)**
   b. State and explain power theorem.   **(10 Marks)**

OR

8 a. Derive an expression for radiation resistance of short electric dipole.   **(10 Marks)**
   b. Explain the principle of pattern multiplication with an example.   **(10 Marks)**

Module-5

9 a. Discuss the working and design considerations of log-periodic antenna.   **(10 Marks)**
   b. Write a short note on Helical antenna geometry.   **(06 Marks)**
   c. Compare the far fields of small loop and short dipole.   **(04 Marks)**

OR

10 a. Show that the radiation resistance of small loop is $31171 \left[\dfrac{A}{\lambda^2} \right]^2$.   **(08 Marks)**

   b. Explain Yagi-uda array with the help of diagram.   **(06 Marks)**
   c. Describe the approximate directivities and beam width of parabolic reflector.   **(06 Marks)**

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18EC63

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Microwave and Antennas

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 principle of working of Reflex Klystron.   (08 Marks)
   b. A Reflex Klystron operates at 10GHx with beam voltage 300V , Repeller space = 1mm for $1\frac{3}{4}$ mode . Calculate $P_{R\,max}$ and corresponding repeller voltage for a beam current of 18mA.   (06 Marks)
   c. Explain Microwave system, with the help of neat diagram.   (06 Marks)

OR

2 a. Define Reflection coefficient and transmission coefficient of a transmission line. Derive and expression for each of them.   (08 Marks)
   b. The input impedance of an antenna is (73 + j42.5)Ω at 900 MHz. Calculate the voltage standing wave ratio.   (04 Marks)
   c. Mention the characteristics of Smith chart.   (08 Marks)

Module-2

3 a. State and explain the properties of 'S' matrix.   (08 Marks)
   b. Explain precision type variable attenuator, with a neat sketch.   (06 Marks)
   c. Explain H plane T junction. Derive its 'S' matrix.   (06 Marks)

OR

4 a. Write the characteristics of Magic Tee. Derive scattering matrix for Magic Tee. (08 Marks)
   b. Impedance matrix of a simple device is given by $\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$. Find its scattering matrix.   (08 Marks)
   c. Write a note on Phase shifters.   (04 Marks)

Module-3

5 a. Explain the construction and field pattern of Microstrip line.   (06 Marks)
   b. Discuss different types of losses in Microstrip line.   (06 Marks)
   c. Define the following with respect to antenna :
      i)   Directivity   ii) Antenna beam efficiency
      iii) Field zones   iv) Effective aperture.   (08 Marks)

OR

6 a. Derive the relationship between Maximum effective aperture and Directivity.   (06 Marks)
   b. Show that Maximum effective aperture of a half wave ($\lambda/2$) antenna is $0.13\lambda^2$. (06 Marks)
   c. Two identical transmitting and receiving antenna with gain of 15dBi at 2.45 GHz are separated by a distance of 3km. If the transmitted power is 20W, then calculate the received power.   (08 Marks)

Module-4

7 a. Find the directivity of an antenna whose radiation intensity is given by
   $U = U_m \cos^4 \theta \sin^2 \phi$, $0 \leq \theta \leq \pi/2$, $0 \leq \phi \leq 2\pi$. **(06 Marks)**

   b. Derive an expression for the field pattern for 'n' isotropic point sources of same amplitude and phase. **(08 Marks)**

   c. Draw the field pattern of a broadside array with number element (n) = 5 and spacing (d) = $\lambda/2$. **(06 Marks)**

OR

8 a. Obtain an expression for the field pattern of two isotropic point sources with equal amplitude and phase. Also plot the field pattern. Assume $d = \lambda/2$. **(08 Marks)**

   b. Derive an expression for radiation resistance of short electric dipole. **(08 Marks)**

   c. Explain the principle of pattern multiplication. **(04 Marks)**

Module-5

9 a. Derive an expression for far field components of small loop antenna. **(08 Marks)**

   b. A Coaxial feed pyramidal horn antenna is designed at 915 MHz with aperture A = 50cm and B = 40cm and horn length from neck to mouth = 27.5cm. Assuming efficiency of 72%. Find approximate gain of the horn antenna. **(06 Marks)**

   c. A parabolic dish antenna provides a power gain of 50dB at 10GHz with 70% efficiency.
   Find i) HPBW   ii) FNBW   iii) Diameter. **(06 Marks)**

OR

10 a. Explain Yagi – Uda array with the help of neat diagram. **(06 Marks)**

   b. A helical antenna with a flat circular ground plane is to be designed to operate in axial mode for a gain of 26dB$_i$ at 5.8 GHz. Calculate i)   Diameter of the helix   ii) Minimum number of turns. **(08 Marks)**

   c. Find the radiation resistance of circular loop antenna of radius 0.32m , Operating at 1MHz. The radius of a wire used is 0.4mm conductivity of the wire is 57 ms/m and μ_r = 1. **(06 Marks)**

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CBCS SCHEME

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18TE63

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

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Define OSI. Explain the OSI model in a layered frame work. **(08 Marks)**
   b. What is Network? Discuss the network criterias to design a network. **(06 Marks)**
   c. Name the five components in the data communication. Explain in brief. **(06 Marks)**

OR

2 a. What are the two principles of protocol layering? **(04 Marks)**
   b. With neat diagram, explain the function of each layer in TCP/IP protocol suite. **(08 Marks)**
   c. Explain the three categories of connecting devices. **(08 Marks)**

Module-2

3 a. Identify unicast, multicast and broad cast from the following MAC addresses.
   i)   4A:30:10:21:10:1A
   ii)   47:20:1B:2E:08:EF
   iii) FF:FF:FF:FF:FF:FF. **(06 Marks)**
   b. Define framing, explain role of bit stuffing in a framing. **(06 Marks)**
   c. Describe 1-persitant, non-persistant and p-persistant methods of CSMA. **(08 Marks)**

OR

4 a. A slotted ALOHA network transmits 200 bit frames using a shared channel with a 200kbps bandwidth. Find the throughput if the system produce.
   i)   1000 frames/sec
   ii)   500 frames/sec
   iii) 250 frames/sec. **(06 Marks)**
   b. What are the characteristics of wireless LAN? **(06 Marks)**
   c. Write a note on piconet and scatternet in Bluetooth. **(08 Marks)**

Module-3

5 a. Explain IPV4 datagram format. **(10 Marks)**
   b. Briefly discuss three phases of remote host and mobile host communication. **(10 Marks)**

OR

6 a. With a neat diagram, explain general format of ICMP messages. **(10 Marks)**
   b. Discuss the distance vector routing algorithm with example. **(10 Marks)**

Module-4

7 a. With a neat diagram, explain connection establishment, data transfer and connection termination in TCP. **(10 Marks)**
   b. Demonstrate stop and wait protocol with the help of FSMS and flow diagram. **(10 Marks)**

OR

8   a.   Discuss the TCP segment format.   (10 Marks)
    b.   The following is the content of UDP reader in hexadecimal format CB84000D001C001C.
         Find:
         i)   What is the source port number?
         ii)   What is destination port number?
         iii)   What is the total length of the datagram?
         iv)   What is the length of the data?
         v)   Is the packet sent from client to server or vice versa?   (10 Marks)

Module-5

9   a.   What are the data flow characteristics?   (04 Marks)
    b.   Explain the priority queuing with neat diagram.   (08 Marks)
    c.   Illustrate the simple leakey bucket algorithm with diagram.   (08 Marks)

OR

10 a.   Explain the architecture of world wide web.   (10 Marks)
    b.   Write the basic model of FTP and explain.   (10 Marks)

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Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Python Application Programming

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Identify three types of errors encounter in python and also explain the basic building blocks of Python program. **(07 Marks)**

     b.   Develop Python programs to i) find the area of a rectangle ii) find whether the given number is eve or odd. In both cases accept the input from the user and program must handle non-numeric input gracefully by printing a message and exiting the program. **(08 Marks)**

     c.   Predict the output and justify your answer :
     i) –15%7   ii) 7.7//6   iii) (200 – 70) * 10/5   iv) 6 *1 ** 3   v) not "True". **(05 Marks)**

OR

2   a.   Write a user defined function named 'solve' that returns the remainder and quotient as division of two numbers accepted from the user print the remainder and quotient separately on the console. **(05 Marks)**

     b.   Make use of necessary example and flow chart to explain the concept of alternate execution, chained conditional and nested conditional and nested conditional statements. **(08 Marks)**

     c.   Make use of necessary code snippets to explain :
     i) Short circuit evaluation
     ii) Type conversion function
     iii) Void functions. **(07 Marks)**

Module-2

3   a.   Mention the advantages of break and continue statement. Write a program to compute the sum of only odd numbers within the given natural number using continue statement. **(08 Marks)**

     b.   Make use of necessary syntax and examples to explain the following string methods :
     i) lower   ii) capitalize   iii) join   iv) isalpha **(08 Marks)**

     c.   Use find and string slicing to extract the second half of the email address in the following string and print the result – "From support @ vtu.ac.in July 9 2022". **(04 Marks)**

OR

4   a.   Write a Python program to accept the file from the user add :
     i) Display the first N-lines of the file
     ii) Find the frequency of occurrence of the word accepted from the user in the file **(10 Marks)**

     b.   Develop a Python program to search for the line that starts with the word "From" in a file. **(05 Marks)**

     c.   Explain 'for' loop with necessary syntax. Write a program to compute the factorial of a number accepted from the user. **(05 Marks)**

Module-3

5 a. Identify the ways of traversing a list. Explain with example. Also explain any two list operations. **(08 Marks)**

   b. Compare and contrast tuples with lists. Explain the following operations in tuple :
   i) Sum of tuples
   ii) slicing operations
   iii) tuple assignment. **(06 Marks)**

   c. Write a program using lists to store and display the average of N integers accepts from the user. **(06 Marks)**

OR

6 a. Develop a program that accepts a sentence and builds dictionary with LETTERS, DIGITS, UPPERCASE, LOWERCASE and key values and their count in the sequence as values.
   Example :
   Sentence = "VTU@123.e - Learning" d = {LETTERS" : 12, "DIGITS" : 3, "UPPERCASE" : 4, "LOWERCAE" : 8}. **(06 Marks)**

   b. Write a Python program to check the validity of a password read by the users. The following criteria should be used to check the validity. Password should have atleast
   i) One upper case letter
   ii) One lower case latter
   iii) One digit
   iv) One special character from ($ # ! @)
   v) Eight characters. **(08 Marks)**

   c. Demonstrate :
   i) The difference between pop and remove methods on lists
   ii) How a dictionary item can be represented as a list of tuples. **(06 Marks)**

Module-4

7 a. Differentiate between pure function and modifier develop a Python program to find duration of an event of start and end time is given by defining class TIME. **(08 Marks)**

   b. What is polymorphism? Explain with snippet code. **(07 Marks)**

   c. Explain init and str method with example. **(05 Marks)**

OR

8 a. Write a Python program that has a class point with attributes as X and Y co-ordinates. Create two objects of this class and find the midpoint of both the points. Also add a method reflux − X to class point, which returns the new point which is the reflection of the point about the X-axis.
   Example : Point (5, 10) ⇒ Reflex − X returns point (5, 10). **(08 Marks)**

   b. Make use of necessary example to explain single, multiple, multilevel and hierarchical inheritance. **(08 Marks)**

   c. Demonstrate the concept of operator overloading with a code snippet. **(04 Marks)**

Module-5

9 a. Make use of an example to explain the significance of XML over the web development.

(08 Marks)

b. Explain any two socket functions. Write a Python program to that makes a connection to a web server and follows the rules of HTTP protocol to request a document and display what server sends back. (08 Marks)

c. What is service oriented architecture? List the advantages of the same. (04 Marks)

OR

10 a. Create a simple spidering program that will go through Twitter accounts and build a database of them. (08 Marks)

b. With necessary diagram and code describe creation of database table using database cursor architecture. (08 Marks)

c. Compare the contrast the Javascript object Notation (JSON) and XML. (04 Marks)

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