USN | | | | | | | | | | 15EC71

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Microwaves and Antennas

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. List four applications of Reflex Klystron.   (04 Marks)
   b. Derive transmission line equations in voltage and current forms.   (06 Marks)
   c. A transmission line is terminated in a resistive load of 1000Ω and has $L = 9\mu H/m$ and $C = 100pF/m$. Calculate reflection coefficient and standing wave ratio.   (06 Marks)

OR

2 a. Define reflection coefficient. Derive an expression for reflection coefficient at load in terms of characteristic impedance and load impedance.   (08 Marks)
   b. Explain microwave system with the aid of a diagram.   (08 Marks)

Module-2

3 a. For a two port network with mismatched load derive an expression for input reflection coefficient.   (06 Marks)
   b. Draw the diagram of Magic–Tee. Derive S–matrix of Magic Tee.   (10 Marks)

OR

4 a. What is a reciprocal device? Write five point comparison among [S], [Z] and [Y] matrices.
                                                                                          (06 Marks)
   b. Given $[z] = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$. Find S–matrix.   (05 Marks)
   c. Explain coaxial line fixed alternator with a diagram.   (05 Marks)

Module-3

5 a. Derive characteristic impedance of micro-strip lines.   (08 Marks)
   b. Define the following terms with respect to antennas :
      i)   Beam area
      ii) Radiation intensity
      iii) Beam efficiency
      iv) Directivity.   (08 Marks)

OR

6 a. Describe ohmic skin losses and radiation losses in micro-strip lines.   (10 Marks)
   b. A parabolic reflector antenna is circular in cross section with a diameter of 1.22m. If the maximum effective aperture is 55% of the physical aperture, calculate gain of the antenna in dB at 20 GHz.   (06 Marks)

Module-4

7 a. Prove that directivity for a source with unidirectional pattern of $U_m COS^n\theta$, where 'n' can be any number, can be expressed as $D = 2(n + 1)$. **(06 Marks)**

   b. Obtain filed expression of two isotropic point sources of same amplitude and phase. **(10 Marks)**

OR

8 a. State and explain power theorem. **(06 Marks)**

   b. Derive an expression for radiation resistance of short electric dipole. **(10 Marks)**

Module-5

9 a. Find directivity and radiation resistance of a loop antenna with diameter of 2λ. **(06 Marks)**

   b. Write a short note on Helical antenna geometry. **(06 Marks)**

   c. What is the directivity in dB of a rectangular horn antenna, which has physical aperture of $81\lambda^2$, with aperture efficiency 89%? **(04 Marks)**

OR

10 a. Derive radiation resistance of a small single turn circular loop antenna with uniform phase current. **(08 Marks)**

   b. Draw the structure of a pyramidal horn antenna. Use the principle of equality of path length and bring out the optimum horn dimensions. **(08 Marks)**

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15EC72

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Digital Image Processing

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1 a. With the help of a block diagram, explain the fundamental steps in digital image processing.
(10 Marks)
   b. Explain the concept of sampling and quantization using a single example.
(06 Marks)

OR

2 a. Explain the importance of brightness adaption and discrimination in image processing.
(06 Marks)
   b. Explain 'false contouring' and check board pattern in image processing.
(06 Marks)
   c. Explain city block distance with an example.
(04 Marks)

Module-2

3 a. Explain the power law transformation and piece –wise linear contrast stretching with a neat graphical illustration.
(10 Marks)
   b. Explain with a block diagram, the basic steps for image filtering in frequency domain.
(06 Marks)

OR

4 a. Perform histogram, equalization of the 5×5 image.

Gray level	0	1	2	3	4	5	6	7
Number of pixels	0	0	0	6	14	5	0	0

Table Q4(a)

whose data is shown in table Q4(a).
(08 Marks)
   b. Explain the smoothing of images in frequency domain using :
i) ideal low pass filter   ii) butter worth low pass filter.
(08 Marks)

Module-3

5 a. Explain the basic model of image restoration process. Explain any four important noise probability density functions.
(10 Marks)
   b. Explain minimum mean square error (Wiener) filtering in image processing.
(06 Marks)

OR

6 a. Explain adaptive mean filter and list its advantages.
(08 Marks)
   b. With necessary mathematical equations, explain estimate the degradation function by modeling.
(08 Marks)

Module-4

7 a. Develop a procedure for converting :
i) RGB to HSI model
ii) HSI to RGB model.
(08 Marks)
   b. Obtain the Harr transform matrix for N = 4.
(08 Marks)

OR

8 a. Write a note on pseudocolor image processing. Explain intensity slicing as applied to pseudo color image processing. **(08 Marks)**

b. Explain Erosion and Dilation in image processing. **(08 Marks)**

Module-5

9 a. Explain Marr-Wildreth edge detector in image processing. **(08 Marks)**

b. Explain MPP algorithm in image representation (MPP – Minimum Permimeter Polygon). **(08 Marks)**

OR

10 a. Explain basic global thresholding with iterative algorithm. **(08 Marks)**

b. Explain simple descriptors and Fourier descriptors. **(08 Marks)**

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CBCS SCHEME

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Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power Electronics

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a.   What is a converter? How are power converters classified? Explain briefly.   **(08 Marks)**
    b.   Give symbol, characteristic features of the following devices:
      GTO, TRIAC, MOSFET, UJT   **(08 Marks)**

OR

2   a.   With necessary waveforms, explain the steady state characteristics of a power transistor.
                                                         (08 Marks)
    b.   Draw the switching model of MOSFET and explain its switching characteristics with neat figure.   **(08 Marks)**

Module-2

3   a.   With a neat figure, explain the dynamic turn-on and turn-off characteristics of a thyristor.
                                                         (08 Marks)
    b.   Derive expression for anode current using two-transistor model in case of SCR.   **(08 Marks)**

OR

4   a.   What is forced commutation? With the help of circuit diagram and waveform, explain the operation of class-A commutation.   **(08 Marks)**
    b.   With neat circuit diagram and waveforms, explain RC – Half wave firing circuit.   **(08 Marks)**

Module-3

5   a.   With a circuit diagram and waveform, explain the working of a single-phase full converter with RL load. Derive an expression for the average voltage across the load.   **(08 Marks)**
    b.   What is a dual converter? Explain its operation with a neat circuit diagram.   **(08 Marks)**

OR

6   a.   What is an AC voltage controller? With the help of waveform, explain ON-OFF AC voltage controller.   **(08 Marks)**
    b.   Explain the operation of single phase bi-directional AC voltage controller for inductive load with the help of circuit diagram and waveforms.   **(08 Marks)**

Module-4

7   a.   Explain the working principle of step-down chopper and derive expression for :
      (i)   Average output voltage
      (ii)   Output power
      (iii) Effective input resistance in terms of chopper duty cycle.   **(08 Marks)**
    b.   Explain the operation of a step-up chopper with resistive load.   **(08 Marks)**

1 of 2

OR

8 a. With the help of circuit diagram, explain four quadrant type E Chopper. (08 Marks)
  b. With the help of circuit diagram and waveforms, explain the working of a Buck regulator. Derive the expression for peal-peak-ripple current of the inductor. (08 Marks)

Module-5

9 a. Explain the operation of single-phase half bridge inverter with feedback diodes, derive the expression for r.m.s output voltage. (08 Marks)
  b. With the help of circuit diagram and waveform, explain the operation of transistorized current source inverter. What are the advantages and disadvantages of CSI? (08 Marks)

OR

10 a. Explain the performance parameters of inverters. (08 Marks)
   b. Explain the variable DC link inverter with circuit diagram and waveforms. (04 Marks)
   c. Write short note on static switches. (04 Marks)

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Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Real Time Systems

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. What is Real Time System? Explain general computer control system with neat block diagram. **(06 Marks)**
   b. Explain different types of programs in system design. **(06 Marks)**
   c. Define :
      i) Clock based system
      ii) Event based system. **(04 Marks)**

OR

2 a. Draw and explain Direct digital control. **(06 Marks)**
   b. Explain dual computer scheme. **(06 Marks)**
   c. Write a note on Hierarchical systems. **(04 Marks)**

Module-2

3 a. Explain pulse interface for input and output operation with a neat block diagram. **(06 Marks)**
   b. What is necessity of using specialized processor if RTS? Explain the different types of parallel computer. **(06 Marks)**
   c. Define Asynchronous and synchronous transmission. **(04 Marks)**

OR

4 a. Explain ISO seven layer model for data communication. **(06 Marks)**
   b. Explain different LAN Topologies. **(06 Marks)**
   c. Write a note on Interrupt response **(04 Marks)**

Module-3

5 a. Explain declaration and initialization of variables and constants. **(06 Marks)**
   b. Explain four language subset in RTS. **(04 Marks)**
   c. Explain use of table driven system with database manager for application oriented software. **(06 Marks)**

OR

6 a. What is cutlass and what are the major requirements of cutlass. **(06 Marks)**
   b. With flow diagram, explain standard structured program constructs. **(04 Marks)**
   c. What if coroutines? Explain use of coroutines with example. **(06 Marks)**

Module-4

7 a. Explain tasks management system with states of tasks. **(06 Marks)**
   b. What is code sharing? How do you overcome the code sharing problem? **(04 Marks)**
   c. Write a note on liveness of RTS. **(06 Marks)**

OR

8 a. Explain the problem of shared memory and how semaphore is used to overcome this problem. **(06 Marks)**

   b. Explain :
      i) Task chaining and swapping
      ii) Task overlying **(06 Marks)**

   c. Describe in briefly mutual exclusion. **(04 Marks)**

Module-5

9 a. Explain foreground and background systems with flowchart. **(06 Marks)**

   b. Describe the single program approach with flow chart respect to RTS design. **(06 Marks)**

   c. Discuss preliminary design detail of RTS. **(04 Marks)**

OR

10 a. Explain with relevant diagrams the Ward and Mellor method. **(07 Marks)**

   b. Explain the Yordon methodology. **(05 Marks)**

   c. Write a note on Drying Oven context diagram. **(04 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
DSP Algorithms and Architecture

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With a neat block diagram, explain DSP systems. Mention the design issues in implementing DSP system. **(08 Marks)**

   b. Explain interpolation process with relevant equations. Find the interpolated sequence if the input $x(n) = [0, 3, 6, 9, 12]$ is inter-plated using $L = 3$. The coefficient of low-pass filter $b_k = [1/3, 2/3, 1, 2/3, 1/3]$. **(08 Marks)**

OR

2 a. Discuss in detail, the typical formats used for numbers to represent signals and coefficients in DSP systems. **(10 Marks)**

   b. Calculate the dynamic range and precision of each of the following number representation formats :
   i)   24-bit, single–precision, fixed-point format
   ii) 48-bit, double–precision, fixed-point format
   iii) A floating–point format with a 16-bit mantissa and an 8-bit exponent. **(06 Marks)**

Module-2

3 a. Design a 4×4 Braun multiplier. Explain in detail with relevant equations comment on bus width. **(10 Marks)**

   b. Explain the following addressing modes :
   i)   Circular addressing mode
   ii) Indirect addressing mode. **(06 Marks)**

OR

4 a. Explain MAC unit with a neat block diagram. Discuss in detail, the methods to avoid overflow/underflow condition. **(10 Marks)**

   b. Explain the function of address generation unit. **(06 Marks)**

Module-3

5 a. Compare the architectural features of three fixed-point DSPs : TMS320C25, DSP56000, ADSP2100. **(04 Marks)**

   b. Explain the functional diagram of barrel shifter of TMS320C54XX processor. **(06 Marks)**

   c. Explain direct addressing mode for TMS320C54XX processor. **(06 Marks)**

OR

6. a. Describe the operation of the following instructions :
   i) MPY *AR2–, * AR4 +0, B
   ii) MAS *AR3–, * AR4 +,B,A
   iii) RPT #2. (06 Marks)
   b. Write a program to compute the sum of three products terms given by the equation
   $y(n) = h_0 x(n) + h_1 x(n – 1) + h_2 x(n – 2)$ where $x(n)$, $x(n – 1)$ and $x(n – 2)$ are data samples
   stored at three successive data-memory locations and h_0, h_1 and h_2 are constants stored at 3
   other successive locations in data-memory. The result $y(n)$ is stored in the data-memory use
   indirect addressing mode to access data and use MAC instruction. (06 Marks)
   c. Show the six-stage pipeline of TMS320C54XX execution. Explain each stage in detail.
   (04 Marks)

Module-4

7. a. Explain the concept of Q-notation and highlight on multiplication of number represented
   using Q–notation. (06 Marks)
   b. Write a TMS320C54XX program that illustrates the implementation of an interpolating FIR
   filter of length 15 and interpolating factor 5. (10 Marks)

OR

8. a. Write TMS320C54XX program for the following subroutines of 8-point FFT implantations.
   i) Butterfly subroutine
   ii) Bit reverse subroutine. (10 Marks)
   b. Derive the expression for optimal scaling factor for DIT-FFT butterfly algorithm. (06 Marks)

Module-5

9. a. Explain in brief how interrupt handling is done in TMS320C54XX device with a flow chart.
   (10 Marks)
   b. Design a circuit to interface an 8KX16 program ROM to TMS320C5416 DSP in the address
   range 7FE000h – 7FFFFFh. (06 Marks)

OR

10. a. Explain with a block dg clipping auto correlation speech detector. (08 Marks)
    b. Explain JPEG algorithms with relevant block diagram for image processing. (08 Marks)

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