USN ☐☐☐☐☐☐☐☐☐☐ **15EC71**

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Microwaves and Antennas

Time: 3 hrs.   Max. Marks: 80

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Smith chart are permitted.

Module-1

1 a. Describe basic principle and working mechanism of oscillation in Reflex Klystron through Apple gate diagram. **(06 Marks)**
   b. What is reflection co-efficient? Obtain an expression for the same. How it is related to standing wave ratio. **(06 Marks)**
   c. A microwave transmission line has a characteristic impedance of $Z_0 = 100 \lfloor 53.13° \Omega$ when it is terminated in a unknown load impedance Z_L, the transmission coefficient was observed to be $1.09 \lfloor 35.34°$. Find :
   i) Reflection coefficient
   ii) Terminating load impedance Z_L. **(04 Marks)**

OR

2 a. What are standing waves? How are they formed? Obtain expression for voltage standing wave and phase pattern of travelling wave. **(06 Marks)**
   b. A load impedance of $Z_L = 60 - j80\Omega$ is required to be matched to a 50Ω co-axial line by using a short circuited stub length 'ℓ' located at a distance 'd' from the load. The wave length of operation is 1 mtr. Using Smith chart find 'd' and 'ℓ'. **(06 Marks)**
   c. Obtain expression for line impedance interms of reflection coefficient. **(04 Marks)**

Module-2

3 a. Explain with neat sketches the construction and operation of a precision type variable attenuator. **(06 Marks)**
   b. Consider a losses H-plane TeeJunction with 50mw of power being fed into port(1) and other two ports(2) and (3) are terminated in matched termination. Calculate the power fed into each of the ports by the junction. **(04 Marks)**
   c. Discuss applications of Magic Tee. **(06 Marks)**

OR

4 a. Explain with neat sketches the construction and operation of a H-plane TeeJunction. List the characteristics and hence derive its S Matrix. **(10 Marks)**
   b. Give relations of Z, Y and ABCD parameter with S-parameter. **(06 Marks)**

Module-3

5 a. What are the losses encountered in microstriplines? Discuss briefly. **(06 Marks)**
   b. Find the directivity for the following pattern :
   i) Bidirectional sine squared pattern
   ii) Unidirectional cosine squared pattern. **(06 Marks)**
   c. Find the solid angle Ω in square degrees on a spherical surface for θ ranging between 20° and 40° and ϕ ranging between 30° and 70°. **(04 Marks)**

OR

6 a. Derive an expression for Aem for short dipole. **(06 Marks)**
   b. Obtain an expression for FRIS transmission formula used in radio communication link.
      (06 Marks)
   c. The normalized field pattern of an antenna is given by $E_n = \sin\theta \sin\phi$ where θ and ϕ ranges between 0 and e_{total}. Find the directivity by accurate method and approximate method.
      (04 Marks)

Module-4

7 a. Drive an expression for e total, peaks array factor, side lobes and nulls for linear uniform array for N-isotropic point sources of equal amplitude and spacing. **(06 Marks)**
   b. Obtain an expression for radiation resistance of dipole. **(06 Marks)**
   c. Find length of half wave dipole at 30 MHz. **(04 Marks)**

OR

8 a. Explain various forms of antenna arrays with neat diagram. **(06 Marks)**
   b. A linear array consists of 4 isotropic point sources. The distance between adjacent element $\lambda/2$. The power applied with equal magnitude and phase difference $- d_r$ obtain field pattern and find BWFN and HPBW. **(10 Marks)**

Module-5

9 a. Derive expression for field component for general loop antenna. **(06 Marks)**
   b. Write general characteristics of Yagi-Uda Antenna. **(04 Marks)**
   c. Calculate directivity of 20 turn helix with $\alpha = 12°$ and circumstances equal to one wave length.
      (06 Marks)

OR

10 a. With neat sketch, explain design equation of Horn Antenna. **(06 Marks)**
   b. Write short note on :
      i) Helical antenna
      ii) Log periodic antenna. **(06 Marks)**
   c. Calculate the horn parameters :
      i) Length L
      ii) Width a
      iii) Flare angle θ
      iv) Flare angle ϕ
      If the month height b is 10λ.
      The horn is fed by a rectangular wave guide with TE_{10} mode. **(04 Marks)**

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15EC72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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. What is Digital Image Processing? Explain in brief. **(02 Marks)**
   b. With a neat block diagram, describe the fundamental steps used in image processing. **(10 Marks)**
   c. Describe briefly the principle of image formation in the human eye. **(04 Marks)**

OR

2 a. Define 4-adjacency, 8- adjacency and m- adjacency. **(06 Marks)**
   b. Consider the image segment shown in Fig.Q2(b).
      i) Let V = {0, 1, 2} and compute the length of shortest 4, 8 and m – paths between p and q. If a particular path does not exist between these two points explain why?
      ii) Repeat for V = {2, 3, 4}

3	4	1	2	0	
0	1	0	4	2	(q)
2	2	3	1	4	
3	0	4	2	1	
1	2	0	3	4	

(p) is at left of the bottom rows

Fig.Q2(b) **(10 Marks)**

Module-2

3 a. With the help of neat graphical illustration, explain the following basic intensity transformations with their applications.
      i) Image negative
      ii) Log transformations
      iii) Power law transformations. **(10 Marks)**
   b. Explain Histogram matching technique. **(06 Marks)**

OR

4 a. What is homomorphic filtering? With block diagram, explain the homomorphic filtering approach used for image enhancement. **(10 Marks)**
   b. Name and explain any three properties of two dimensional discrete Fourier transform. **(06 Marks)**

Module-3

5 a. Define the process of image restoration. Draw and explain image degradation and restoration model. **(05 Marks)**
   b. Discuss adaptive median filter used in image restoration system. **(05 Marks)**
   c. Explain inverse filtering used in image Restoration process. List its limitations. **(06 Marks)**

OR

6 a. Name the commonly used noise probability density functions in digital image processing
       and explain any four of them.   (08 Marks)
   b. Explain Wiener filtering/minimum mean square error used in image processing.   (08 Marks)

Module-4

7 a. Explain color conversion from RGB to HIS and form HIS to RGB.   (08 Marks)
   b. What is pseudo color image processing? Explain intensity slicing technique of pseudo color
      image processing with geometric interpretation diagram.   (08 Marks)

OR

8 a. With necessary diagram, explain the two band sub band coding and decoding system with its
      spectrum with its spectrum splitting properties used in multi-resolution analysis.   (08 Marks)
   b. With necessary diagrams describe the erosion and Dilatio process of morphological image
      processing.   (08 Marks)

Module-5

9 a. Describe the canny edge detector algorithm with its basic objectives used in image edge
      detection process.   (08 Marks)
   b. Explain the optimum global thresholding using Otsu's algorithm used in image
      segmentation process.   (08 Marks)

OR

10 a. Explain the following representation approaches
       i) Boundary following
       ii) Chain codes.   (08 Marks)
    b. Explain the following boundary descriptors
       i) Shape number
       ii) Fourier descriptor.   (08 Marks)

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Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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.   Draw the control characteristics of the following:
        i) SCR   ii) GTO   iii) MCT   iv) IGBT   **(08 Marks)**
     b.   What are the peripheral effects of power electronics equipment and mention how to overcome it?   **(08 Marks)**

OR

2.   a.   Explain different types of power electronics converter circuits with input and output waveforms   **(08 Marks)**
     b.   Explain the switching characteristics of IGBT and mention its advantages.   **(08 Marks)**

Module-2

3.   a.   Explain two-transistor analogy of SCR.   **(08 Marks)**
     b.   i)   Explain the need for dv/dt and di/dt protection for SCR.
        ii)   A SCR circuit has the following data: $v_s = 200v$, $dv/dt = 100v/\mu s$, $di/dt = 50$ A/μs. Calculate the snubber circuit components.   **(08 Marks)**

OR

4.   a.   Discuss dynamic turn-on and turn-off characteristics of SCR.   **(08 Marks)**
     b.   With neat circuit diagram, explain the working of class-A self commutation with relevant waveforms.   **(08 Marks)**

Module-3

5.   a.   Explain the operation of single-phase full converter with neat circuit diagram and waveform. Derive expression for average and rms output voltage.   **(08 Marks)**
     b.   i)   Explain how a dual-converter works in all four quadrants.
        ii)   A single phase dual converter is operated from a 120V, 50Hz supply and the load resistance R = 10Ω. The circulating inductance is $L_r = 40mH$. Delay angles are $\alpha_1 = 60°$ and $\alpha_2 = 120°$. Calculate the peak circulating current and the peak current of converter 1.   **(08 Marks)**

OR

6.   a.   Explain the principles of ON-OFF control for single-phase AC voltage controller. Draw the circuit and relevant waveforms.   **(08 Marks)**
     b.   A single phase full converter working on ON-OFF control technique has supply voltage of 230V RMS, 50Hz, load = 50Ω. The controller is ON for 30 cycles and OFF for 40 cycles. Calculate:
        i)   ON and OFF time intervals
        ii)   RMS output voltage
        iii)   Input pf
        iv)   Avg and rms thyristor currents.   **(08 Marks)**

Module-4

7 a. Explain the working of step down choppers with waveforms and derive the expression for output voltage. (08 Marks)

   b. Explain the working of boost-regulator and derive expression for average output voltage. (08 Marks)

OR

8 a. Explain the principle of step-up chopper. Derive expression for output voltage. (08 Marks)

   b. I. Explain four quadrant operation of chopper.

      II. Consider the switch, to be ideal in the circuit of Fig.Q.8(b), determine:

         i) Duty cycle K for which $V_{0\,av} = V_{0,rms}$
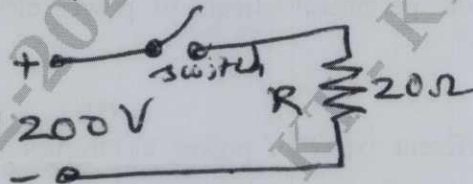
         ii) The chopper efficiency

Fig.Q.8(b)

(08 Marks)

Module-5

9 a. Explain the performance parameters of inverters. (08 Marks)

   b. i) Give comparison between voltage source inverter and current source inverter.

      ii) Explain half bridge inverter with inductive load. (08 Marks)

OR

10 a. Explain the working of transistorized current source inverter. (08 Marks)

   b. i) Explain with neat circuit variable dc link inverter. Mention its advantages and disadvantages.

      ii) Considering a single phase bridge inverter if $V_s = 200v$ and $V_{01(rms)}$ is 90V, determine the delay angle β. (08 Marks)

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Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Real Time System

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a. Explain the following:
      (i)   Clock based task.
      (ii)   Event based task.
      (iii)   Interactive task.   **(06 Marks)**
   b. Define Real Time System. Explain different types of programs in system design.   **(10 Marks)**

OR

2   a. Explain supervisory control with example of an evaporation plant.   **(08 Marks)**
   b. Explain loop control with diagram and list advantages of loop control over analog control.
                                                          (08 Marks)

Module-2

3   a. Explain analog input and output interface.   **(08 Marks)**
   b. Explain Daisy chain interrupt structure with block diagrams.   **(08 Marks)**

OR

4   a. Explain different uses of interrupt.   **(08 Marks)**
   b. Explain asynchronous and synchronous transmission techniques with diagrams.   **(08 Marks)**

Module-3

5   a. Explain in brief, the major requirement for real time languages.   **(12 Marks)**
   b. Define the following with respect to real time programming (i) Global and local variables
      (ii) Scope and visibility.   **(04 Marks)**

OR

6   a. Discuss standard structure program constructs used in real time programming language.
                                                           (08 Marks)
   b. Explain different types of data types briefly.   **(08 Marks)**

Module-4

7   a. Explain priority structure in brief with diagram.   **(08 Marks)**
   b. List the functions of task management. Explain with diagram, task state diagram and task
      states.   **(08 Marks)**

OR

8   a. Discuss significance of memory management and explain task chaining and task overlaying.
                                                         (10 Marks)
   b. Explain : (i) Serially reusable code.   (ii) Re-entrant code.   **(06 Marks)**

Module-5

9   a. Explain planning phase and development phase involved in design of real time system.
                                                        (10 Marks)
   b. Describe foreground/background approach with flow chart.   **(06 Marks)**

OR

10 a. Write a note on Yourdon methodology.   **(06 Marks)**
   b. Differentiate between Ward and Mellor and Hatley and Pirbhai methodology.   **(04 Marks)**
   c. Explain requirement model with diagram for Hatley and Pirbhai method.   **(06 Marks)**

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15EC752

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
IOT and Wireless Sensor Networks

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1   a. Draw the oracle reference architecture of IoT and mention its features. **(08 Marks)**
    b. Describe adaption layer gate way, data enrichment, data consolidation and device management functions. **(08 Marks)**

OR

2   a. Explain the modified OSI model for IoT/M2M systems. Explain COAP – SMS in brief. **(08 Marks)**
    b. Explain the features of XMPP with neat block diagram. **(08 Marks)**

Module-2

3   a. Compare the features in IPV_4 and IPV_6. **(08 Marks)**
    b. List the features of 6LOWPAN with neat diagram. **(08 Marks)**

OR

4   a. What are deployment models for cloud services for IoT applications? **(08 Marks)**
    b. Explain IoT cloud based data collection, storage and computing services using Nimbits. **(08 Marks)**

Module-3

5   a. List the additional features in Intel Galileo device plat form over Arduino, Tabulate for comparing the usages and features of IDE's for Raspberry P_i. **(08 Marks)**
    b. List five levels of software which need to be developed for applications and services for IoT and M2M. Write the features of Eclipse IoT stack. **(08 Marks)**

OR

6   a. What do you mean by trust? Define message privacy list the main vulnerabilities for attack? **(08 Marks)**
    b. Draw layered attacker model and explain the solutions for mitigating the attacks on the layer. **(08 Marks)**

Module-4

7   a. What are the challenges for wireless sensor networks, mention required mechanisms. **(08 Marks)**
    b. Explain hardware components of single node architecture of WSN with neat diagram. **(08 Marks)**

OR

8   a. Explain the transceiver structure with neat diagram and explain briefly the enabiling technologies for wireless sensor networks. **(08 Marks)**
    b. Explain event based programming model for WSN, what is the need for gate way? Explain how WSN is connected to internet. **(08 Marks)**

Module-5

9 a. Explain the design considerations for physical layer and transceiver in brief. Mention how the mediation device protocol is helpful for achieving low duty cycle. **(08 Marks)**

  b. Explain SMACS and LEACH protocol with neat diagram. **(08 Marks)**

OR

10 a. What are the features to be considered for energy efficient routing explain in brief. **(08 Marks)**

  b. Explain geographic routing in brief. **(08 Marks)**

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