CBCS SCHEME

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15EC71

Seventh Semester B.E. Degree Examination, July/August 2021
Microwave and Antennas

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Derive the general transmission line equation to find voltage and current on the line interms of position 'z' and time 't'. **(08 Marks)**
b. With a neat diagram, explain the operation of Reflex Klystron. **(08 Marks)**

2 a. Define transmission coefficient. Derive the equation for transmission coefficient of power transmission line. **(08 Marks)**
b. A transmission line has a characteristic impedance of 75 + j0.01Ω and is terminated in a load impedance of 70 + j50Ω. Compute :
i) Reflection coefficient
ii) Transmission coefficient
iii) Verify relation between reflection and transmission coefficient
iv) Verify $T = 1 + \Gamma$. **(08 Marks)**

3 a. Explain non-reciprocal phase shifter with a neat diagram. **(08 Marks)**
b. In an H-plane T-junction, compute power delivered to the loads of 40Ω and 60Ω connected to arms 1 and 2 when a 10mw power is delivered to the matched port 3. **(08 Marks)**

4 a. What are waveguide tees? Explain its types. **(08 Marks)**
b. Briefly explain the applications of Magic – T. **(08 Marks)**

5 a. Explain the losses in microstrip lines. **(08 Marks)**
b. A lossless parallel strip line has a conducting strip width w. the substrate dielectric constant ϵ_{rd} of 6 (BeO) and a thickness 'd' of 4mm. Calculate :
i) Width w of the strip to have a characteristic impedance of 50Ω
ii) Strip-line capacitance
iii) Strip-line inductance
iv) Phase velocity of wave in parallel strip line. **(08 Marks)**

6 a. Define directivity. Derive the relation between :
i) Directivity and beam solid angle
ii) Directivity and effective aperture. **(08 Marks)**
b. Show that maximum effective aperture of λ/2 dipole (Aem) = $0.13\lambda^2$ and Directivity = 1.63. **(08 Marks)**

7 a. Derive an expression and draw the field pattern for an array of two isotropic point sources with equal amplitude and opposite phase. **(08 Marks)**

b. Find the power and directivity of :

i) $U = U_m \sin^2\theta$ for $0 \le \theta \le \pi$; $0 \le \phi \le 2\pi$

ii) $U = U_m \cos^2\theta$ for $0 \le \theta \le \pi/2$; $0 \le \phi \le 2\pi$. **(08 Marks)**

8 a. Derive the radiation resistance of thin $\lambda/2$ antenna. **(08 Marks)**

b. Explain :

i) Power theorem

ii) Multiplication pattern. **(08 Marks)**

9 a. Derive the radiation resistance of small loop. **(08 Marks)**

b. Explain in brief with neat figure.

i) Horn Antenna

ii) Yagi Uda Antenna. **(08 Marks)**

10 a. With neat diagram, explain the following

i) Log periodic antenna

ii) Helical antenna. **(08 Marks)**

b. Find the directivity, beam width and effective area of the parabolic reflector for which the reflector diameter is 6m and apperature efficiency is 0.65. The frequency of operation is 10GHz. **(08 Marks)**

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15EC72

Seventh Semester B.E. Degree Examination, July/August 2021
Digital Image Processing

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions.

1 a. Explain the fundamental steps in digital image processing along with a block schematic. **(08 Marks)**

b. Define horizontal neighbors, vertical neighbors and diagonal neighbors for pixel p(x, y). Also determine the three distance measures between p(x, y) and q(s, t) in Fig.Q1(b), where coordinate starts with (0, 0) in this grayscale image.

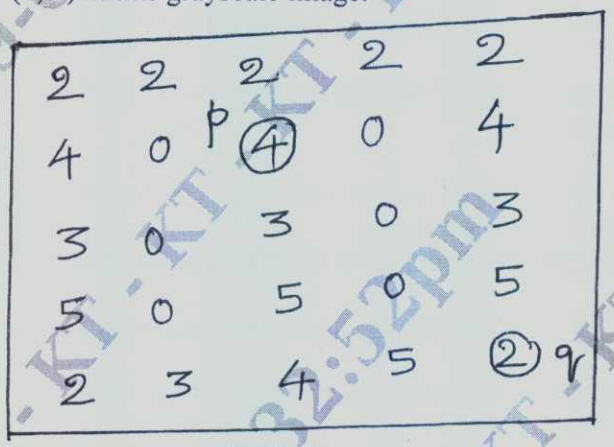

Fig.Q1(b) **(08 Marks)**

2 a. Explain image acquisition using single sensor, sensor strips and sensor arrays with relevant diagrams. **(09 Marks)**

b. Explain 4-adjacency, 8-adjacency and a region, linear and non-linear operators in image processing, for a 2-dimensional image with an example for each. **(07 Marks)**

3 a. Explain image negative, log transformation and power-law transformation with equations and figures. **(06 Marks)**

b. Explain historgram equalization for the given set of values in Table.Q3(b), determine the equalized histogram for a 3-bit image of size 64 × 64 pixels.

K	0	1	2	3	4	5	6	7
r_K	0	1	2	3	4	5	6	7
n_K	790	1023	850	656	329	245	122	81

Table.Q3(b) **(10 Marks)**

4 a. Explain the 7 steps used for filtering in the frequency domain. Define 2-D convolution theorem. **(06 Marks)**

b. Describe image sharpening using the following frequency domain filters:
(i) Ideal highpass filter
(ii) Butterworth highpass filter
(iii) Gaussian highpass filter **(10 Marks)**

5 a. Explain Gaussian, Rayleigh and Erlang noise models with equations and graphs. **(06 Marks)**

b. Describe adaptive local noise reduction filter and adaptive median filter used for removing noise in images. **(10 Marks)**

6 a. Explain arithmetic mean, geometric mean and median filter with equations and their usage for noise removal in images. **(06 Marks)**

b. Describe bandreject, bandpass and notch filters used for reduction of periodic noise with equations and figures. **(10 Marks)**

7 a. Explain the RGB color model with a cube structure and color equivalent values. Write the equations to convert RGB to HIS and HIS to RGB for color components. **(10 Marks)**

b. Briefly explain the subband coding with a block diagram of a simple digital filter and impulse response for the input $f(n) = \delta(n)$. **(06 Marks)**

8 a. Explain erosion and dilation operations along with their duality equations and examples with images. **(08 Marks)**

b. Describe opening and closing operations along with their duality equations and examples with images. **(08 Marks)**

9 a. Explain how isolated points and lines can be detected in images using derivatives and Laplacian mask respectively. **(08 Marks)**

b. Describe Canny edge detection method with equations and figures. **(08 Marks)**

10 a. Explain boundary following and chain codes used for representation for describing regions. **(08 Marks)**

b. Describe the MPP algorithm and its illustration with an example of vertices. **(08 Marks)**

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15EC743

Seventh Semester B.E. Degree Examination, July/August 2021
Real Time Systems

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Define : (i) Real time system (ii) Clock based system (iii) Event based system (iv) Interactive system. **(08 Marks)**

b. Explain the different types of programs in system design. **(08 Marks)**

2 a. With a neat diagram, explain the sequential control Real Time System. **(10 Marks)**

b. Write a note on hierarchical system. **(06 Marks)**

3 a. What is necessity of using specialized processors in RTS? Explain the different forms of parallel computer architecture. **(10 Marks)**

b. Explain with diagram of Analog input interface. **(06 Marks)**

4 a. Explain digital interface for input and output operation. **(10 Marks)**

b. With a neat diagram, explain interrupt masking. **(06 Marks)**

5 a. List and explain in brief, the major requirement for a real time language. **(12 Marks)**

b. Explain the syntax layout and readability. **(04 Marks)**

6 a. With a neat block diagram, explain the table driven approach to device special application software. **(10 Marks)**

b. Discuss the co-routines of RTS. **(06 Marks)**

7 a. List the basic functions of the task management. Explain the task states with the help of task state diagram. **(10 Marks)**

b. Explain the three levels of priority structures. **(06 Marks)**

8 a. Explain the issue of synchronous and communication in intex task communication. **(10 Marks)**

b. Describe in brief mutual exclusion. **(06 Marks)**

9 a. With a neat diagram, explain the development phase of RTS. **(10 Marks)**

b. Explain the basic software modules. **(06 Marks)**

10 a. Explain the YOURDON METHODOLOGY of RTS development. **(08 Marks)**

b. With a neat diagram, explain Ward and Meller method. **(08 Marks)**

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15EC752

Seventh Semester B.E. Degree Examination, July/August 2021
IOT and Wireless Sensing Networks

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions.

1 a. Define IOT and discuss briefly IBM IOT conceptual frame work. **(08 Marks)**
b. Discuss IETF six layer modified OSI model for IOT/M2M systems. **(08 Marks)**

2 a. Discuss briefly the Technology behind IOT. **(08 Marks)**
b. With a neat diagram, briefly explain MQTT and XMPP message communication protocol for message interchange between M2M/IOT device objects and web objects. **(08 Marks)**

3 Compare and contrast:
a. IPV4 and IPV6 **(05 Marks)**
b. HTTP and HTTPS **(05 Marks)**
c. FTP and TELNET **(06 Marks)**

4 a. Discuss 6 LOWPAN protocol stack. **(08 Marks)**
b. With a neat diagram, discuss IOT cloud based data collection, storage and computing services using Nimbits. **(08 Marks)**

5 a. What are the features of Arduino IDE that enables the programming task simpler at Arduino platform? **(04 Marks)**
b. List the steps involved while programming of Arduino for usage of analog sensor devices at SPI port. **(04 Marks)**
c. With a neat diagram, discuss briefly five levels for software development for applications and services in IOT or M2M. **(08 Marks)**

6 a. List the OWASP-Vulnerabilities in IOT Applications/services. **(04 Marks)**
b. Discuss briefly security function group components with regards to IOT reference architecture. **(06 Marks)**
c. With a neat diagram, discuss a layered attacker model and possible attacks on layers. **(06 Marks)**

7 a. What are the major challenges wireless sensor networks are facing? Explain in detail. **(10 Marks)**
b. Describe the enabling technologies for wireless sensor networks. **(06 Marks)**

8 a. Describe the single node architecture with appropriate diagram. **(08 Marks)**
b. Explain briefly about requirements for WSN service interface. **(08 Marks)**

9 Write short notes on:
a. LEACH **(06 Marks)**
b. SMACS **(05 Marks)**
c. TRAMA **(05 Marks)**

10 Write short notes on:
a. Energy efficient routing **(05 Marks)**
b. Geographic routing **(05 Marks)**
c. Hierarchical networks by clustering. **(06 Marks)**

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