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17EC71

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
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. With neat diagram, explain construction and operation of reflex Klystron. **(10 Marks)**

b. Define and derive an expression for reflection coefficient when the transmission line is terminated by load impedence (Z_L). **(06 Marks)**

c. A transmission line working at RF has following constants, L = 9 μH/m, C = 16 PF/m the line is terminated in a resistive load of 1000 Ω. Find the reflection coefficient and standing wave ratio. **(04 Marks)**

OR

2 a. Explain the different mode current of reflex klystron. **(06 Marks)**

b. Show the relationship between standing wave ratio and reflection coefficient. **(06 Marks)**

c. A transmission line has the following primary constants per km of the line, R = 8 Ω, G = 0.1 μ℧, L = 3.5 mH and C = 9 nF. Calculate Z_0, α, β, VP and λ at W = 5000 rad/sec. **(08 Marks)**

Module-2

3 a. Define the following losses in microwave interms of s-parameters, (i) Transmission loss (ii) Reflection loss (iii) Return loss (iv) Insertion loss **(06 Marks)**

b. Explain S-matrix representation for multi port network. **(06 Marks)**

c. State the properties of S-parameters, prove the symmetry property and unitary property of S-parameter. **(08 Marks)**

OR

4 a. With a neat diagram, explain rotary precision phase shifter. **(06 Marks)**

b. What is magic tee? Explain magic tee and derive an S-matrix. Mention its application. **(08 Marks)**

c. Explain different types of co-axial connectors in microwave circuits. **(06 Marks)**

Module-3

5 a. What are the losses in microstrip lines? Explain the radiation losses. **(08 Marks)**

b. Show that the maximum effective aperture of a short dipole is $0.119\lambda^2$. **(06 Marks)**

c. Obtain the expression for inductance, capacitance and hence characteristic impedance of a parallel strip line. **(06 Marks)**

OR

6 a. Derive characteristic impedance of microstrip line with diagram. **(06 Marks)**

b. Using power theorem find the directivity for the source with unidirectional cosine square power pattern. $U(\theta,\phi) = U_m \cos^2\theta$. **(06 Marks)**

c. Explain the following parameters with respect to antenna:
(i) Directivity (ii) Beam area (iii) Radiation intensity (iv) Beam efficiency **(08 Marks)**

Module-4

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

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

c. A source has a radiation intensity pattern given by $U = U_m \sin\theta$ for $0 \le \theta \le \frac{\pi}{2}$ and $0 \le \phi \le 2\pi$, find the power and directivity. **(06 Marks)**

OR

8 a. Derive an expression and draw the field pattern of two isotropic point sources of same amplitude and phase. **(08 Marks)**

b. Obtain the expression for field of dipole in general for the case of thin linear antenna. **(06 Marks)**

c. For a short dipole $\frac{\lambda}{15}$ long find the efficiency, radiation resistance if loss resistance is 1 Ω and also find the (i) Maximum effective aperture (ii) Efficiency (iii) Radiation resistance. **(06 Marks)**

Module-5

9 a. Obtain the expression for radiation resistance of small loop antenna. **(08 Marks)**

b. Determine the directivity of loop antenna having radius 1.0 m when it is operated at 0.9 MHz. **(04 Marks)**

c. Discuss the following:
   (i) Yagi Uda antenna.
   (ii) Log periodic antenna. **(08 Marks)**

OR

10 a. Explain Helical geometry with diagram and practical consideration for the manofillar axial mode helical antenna. **(08 Marks)**

b. Derive the expression of far field equation of small loop antenna, with diagram. **(08 Marks)**

c. Find the radiation resistance of a loop antenna with diameter 0.5 m operating frequency at 1 MHz. **(04 Marks)**

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17EC72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Digital Image Processing

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain with block diagram, the fundamental steps used in digital image processing. **(10 Marks)**

b. Explain with relevant diagrams, different sensor arrangements. **(10 Marks)**

OR

2 a. Explain the process of sampling and quantization, with relevant diagrams. **(10 Marks)**

b. Define following: (i) Spatial and Intensity Resolution (ii) 4-, 8- and m-adjacency (iii) Euclidean distance, city-block distance and chessboard distance **(10 Marks)**

Module-2

3 a. Explain with plots, some basic intensity transformation functions. **(10 Marks)**

b. With relevant equations, discuss the discrete Laplacian of two variables and different implementation of Laplacian operator masks. **(10 Marks)**

OR

4 a. Discuss with relevant diagrams, the image smoothing using the frequency domain low pass filters (i) Ideal (ii) Butterworth (iii) Gaussian **(10 Marks)**

b. Explain the following selective filter: (i) Bandreject and Bandpass Filters (ii) Notch Filters **(10 Marks)**

Module-3

5 a. Discuss various noise models with respect to image restoration process. **(10 Marks)**

b. Explain the following methods for estimating degradation function: (i) Estimation by image observation (ii) Estimation by experimentation **(10 Marks)**

OR

6 a. Explain the process of restoration of images using Inverse Filtering technique. **(10 Marks)**

b. Explain with relevant equations, Minimum Mean Square Error (Wiener) Filtering. **(10 Marks)**

Module-4

7 a. Explain the following color models: (i) RGB (ii) HSI **(10 Marks)**

b. Explain Pseudocolor Image Processing. **(10 Marks)**

OR

8 a. Explain the following Morphological operations: (i) Erosion (ii) Dilation (iii) Opening (iv) closing **(10 Marks)**

b. Explain multi-resolution expansions used in image processing. **(10 Marks)**

Module-5

9 a. Explain Thresholding based segmentation. Discuss: (i) Global Thresholding (ii) Adaptive Thresholding **(10 Marks)**

b. Explain segmentation of images using Morphological Watersheds. **(10 Marks)**

OR

10 a. Explain Chain Codes used to represent a boundary. **(10 Marks)**

b. Discuss various approaches of boundary description. **(10 Marks)**

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17EC73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw the symbols and the V-I characteristics of the following power semiconductor devices: (i) Diode (ii) Thyristor (SCR) (iii) SITH (iv) GTO (v) TRIAC **(10 Marks)**

b. Explain peripheral effects of power electronic components and equipment, mention how to eliminate them. **(06 Marks)**

c. List out different applications of power electronic system. **(04 Marks)**

OR

2 a. Explain the important characteristic features of power transistors and discuss different operating ranges of power BJT with the aid of output and transfer characteristic. **(10 Marks)**

b. Illustrate the switching characteristics of power MOSFET with necessary waveforms. **(10 Marks)**

Module-2

3 a. Describe modes of operation of SCR with a neat V-I characteristic. **(10 Marks)**

b. Develop two transistor model and derive an expression for anode current in terms of transistor parameters for a thyristor. **(10 Marks)**

OR

4 a. Illustrate with neat diagrams and waveforms, the operation of UJT triggering circuit for SCR. **(10 Marks)**

b. Estimate the required parameter for Snubber circuit to provide $\frac{dv}{dt}$ protection to SCR used in single phase bridge converter; the SCR has a maximum $\frac{dv}{dt}$ of 60 V/Msec. the input line to line voltage has peak value of 425 V and series inductance of 0.2 mH. **(05 Marks)**

c. Compare natural commutation and forced commutation. **(05 Marks)**

Module-3

5 a. Describe with neat diagram and waveforms, half wave controlled rectifier with freewheeling diode and obtain average value of output voltage. **(12 Marks)**

b. A single phase full converter is operated from 120 V, 60 Hz supply. The load current with an average value of I_a is continuous with negligible ripple current. If turn ON ratio of transformer is unity with delay angle $\alpha = \frac{\pi}{3}$. Calculate:

(i) Harmonic Factor (HF) of input current
(ii) Displacement Factor (DF)
(iii) Supply Power Factor (PF) **(08 Marks)**

OR

6 a. Illustrate with neat circuit diagram and waveforms, the working principle of single phase AC voltage controller using phase control. Obtain average value of output voltage for single phase half wave controller. **(12 Marks)**

b. A single phase half wave AC voltage controller has resistance load of R = 5Ω and input voltage V_S = 120 V, 60 Hz. The delay angle of thyristor is $\alpha = \frac{\pi}{3}$, determine:

(i) rms output voltage (ii) input power factor (iii) average input current **(08 Marks)**

Module-4

7 a. Demonstrate the working principle of step-down Chopper with RL load. Derive an expression for average and rms value of load voltage. **(12 Marks)**

b. A step up dc chopper has an input of 200 v and an output of 250 V. The blocking period (T_{off}) in each cycle of operation is 0.6×10^{-3} seconds. Find the period of conduction (T_{ON}) in each cycle. **(08 Marks)**

OR

8 a. Outline the different performance parameters of dc choppers. **(06 Marks)**

b. Describe class D chopper with neat diagram. **(08 Marks)**

c. Design the filter components for buck convert which has an input voltage of 12V and output voltage of 5V. The peak to peak ripple voltage is 20 mV and peak to peak ripple current of inductor is limited to 0.8A. The switching frequency is 25 kHz. **(06 Marks)**

Module-5

9 a. With the help of circuit diagram and waveforms, explain the working of single phase bridge inverters. **(12 Marks)**

b. The single phase full bridge inverter with resistive load of R = 2.4 Ω and dc input voltage V_S = 48V. Determine:

i) RMS output voltage at the fundamental frequency
ii) Output power
iii) Peak current and average current of each transistor **(08 Marks)**

OR

10 a. Outline various performance parameters used for inverters. Compare Current Source Inverter (CSI) and Variable DC link inverter. **(10 Marks)**

b. Explain AC Switches (single phase) and Microelectronic Relays (MER) with neat diagram. **(10 Marks)**

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17EC743

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define Real Time System. Explain different classification of Real Time System with example. **(08 Marks)**

b. Explain computer control system showing hardware and software interface. **(06 Marks)**

c. Discuss different types of programs in system design. **(06 Marks)**

OR

2 a. Explain sequence control for single chemical reactor vessel with diagram. **(08 Marks)**

b. Explain the following: i) Batch process ii) Continuous process. **(06 Marks)**

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

Module-2

3 a. Explain Digital input and output Interface with diagrams. **(10 Marks)**

b. Explain different forms of parallel computer architectures. **(10 Marks)**

OR

4 a. Explain daisy chains interrupt structure. **(08 Marks)**

b. Write a note on multilevel interrupts. **(06 Marks)**

c. Discuss Asynchronous and Synchronous Transmission techniques. **(06 Marks)**

Module-3

5 a. Explain the following: i) Security ii) Readability iii) Portability iv) Efficiency. **(10 Marks)**

b. Discuss different data types with example. **(10 Marks)**

OR

6 a. Explain briefly declaration and initialization of variables and constants. **(08 Marks)**

b. Write a short note on exception handling. **(06 Marks)**

c. Explain Coroutines. **(06 Marks)**

Module-4

7 a. Explain typical structure of Real time operating system with diagram. **(08 Marks)**

b. Describe different types of scheduling strategies. **(06 Marks)**

c. Explain task chaining and swapping with diagram. **(06 Marks)**

OR

8 a. Explain general structure of Input output subsystem. **(08 Marks)**

b. Explain: i) Serially reusable code ii) Re-entrant code. **(06 Marks)**

c. Write a note on monitors. **(06 Marks)**

Module-5

9 a. Explain planning phase and development phase related to design of Real time system. **(10 Marks)**

b. Describe foreground background approach with reference to Real time system design. **(10 Marks)**

OR

10 a. Explain context diagram for drying oven in case of Ward and Mellor method. **(06 Marks)**

b. Differentiate between Ward and Mellor and Hatley and Pirbhai methodologies. **(06 Marks)**

c. Explain requirement model in case of Hatley and Pirbhai method. **(08 Marks)**

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17EC752

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

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Describe IoT reference model suggested by CISCO. **(08 Marks)**
b. With neat diagram, explain M2M architecture. **(08 Marks)**
c. Explain the enabling technologies for IoT. **(04 Marks)**

OR

2 a. Explain MQTT protocol for IoT. **(08 Marks)**
b. Write and explain modified OSI model for the IoT/M2M system. **(08 Marks)**
c. Write and explain 4 layer architectural frameworks developed at CISCO for a city. **(04 Marks)**

Module-2

3 a. Explain Internet Protocol Version 4. **(08 Marks)**
b. Explain DHCP protocol for dynamically configuring the IP address and other networks. **(08 Marks)**
c. List any 4 important features of HTTP port. **(04 Marks)**

OR

4 a. Explain four cloud deployment models. **(06 Marks)**
b. Explain in detail different cloud service models used in IoT. **(08 Marks)**
c. List the essential features of cloud storage and computing. **(06 Marks)**

Module-3

5 a. Write and explain traffic light control program using Arduino UNO. **(10 Marks)**
b. Explain security requirements and threat analysis. **(10 Marks)**

OR

6 a. Describe how data is read from sensors and devices. **(10 Marks)**
b. Explain IOT security tomography and layered attacker model. **(10 Marks)**

Module-4

7 a. Explain single node architecture of WSN with neat diagram. **(10 Marks)**
b. Explain optimization goals and figures of merit in WSN. **(10 Marks)**

OR

8 a. Explain gateway concepts. **(10 Marks)**
b. Explain challenges and characteristics requirements of WSN. **(10 Marks)**

Module-5

9 a. Explain in brief the LEACH protocol in WSN. **(10 Marks)**
b. Explain energy efficient unicast routing. **(10 Marks)**

OR

10 a. Explain SMAC protocol. **(10 Marks)**
b. Explain CSMA protocol. **(10 Marks)**

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