CBCS SCHEME

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17EC71

Seventh Semester B.E. Degree Examination, July/August 2022
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. Describe the different mode curve in the case of reflex klystron. **(04 Marks)**

b. A transmission line has the following parameters R = 5Ω/m, L = 5.2×10^{-8}H/m, G = 6.2×10^{-3} mho/m and C = 2.13×10^{-10}F/m. The signal frequency is 4 GHz. Calculate its characteristics impedance and propagation constant. **(06 Marks)**

c. Derive the general transmission line equation to find voltage and current on the line in terms of position 'Z' and time 't'. **(10 Marks)**

OR

2 a. List IEEE recommended micro wave frequency bands. **(04 Marks)**

b. Define reflection coefficient. Derive the equation for reflection coefficient at the load end at a distance 'd' from the load. **(08 Marks)**

c. Discuss the following :
i) Standing Wave Ratio
ii) Single Stub Matching. **(08 Marks)**

Module-2

3 a. Show that impedance and admittance matrices are symmetrical for a reciprocal junction. **(05 Marks)**

b. Draw the diagram of Magic – Tee. Derive S – matrix of the Magic Tee. **(10 Marks)**

c. A shunt impedance Z is connected across a transmission line with characteristics impedance Z_0. Find the S – matrix of the junction. **(05 Marks)**

OR

4 a. With a neat diagram explain the working of precision phase shifter. **(08 Marks)**

b. A 20mW signal is fed into one of the collinear Port 1 of a lossless H – plane T – junction. Calculate the power delivered through each port when other ports are terminated in matched load. **(04 Marks)**

c. With diagrams explain E – plane Tee and H – Plane Tee. **(08 Marks)**

Module-3

5 a. Derive the characteristic impedance of microstrip lines. **(08 Marks)**

b. Explain basic radiation equation in brief. **(05 Marks)**

c. What is maximum power received at a distance of 0.5km over a free – space 1 – GHz circuit consisting of a transmitting antenna with a 25 – dB gain and a receiving antenna with a 2-dB gain? The gain is with respect to a lossless isotropic source. The transmitting antenna input is 150W. **(07 Marks)**

OR

6 a. Explain ohmic losses and radiation losses in detail. **(08 Marks)**

b. Show that maximum effective aperture of a $\lambda/2$ dipole antenna is $0.13\lambda^2$. **(07 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 ε_{rd} of 6 and a thickness d of 4mm. Calculate :

i) The required width w of the conducting strip in order to have a characteristic impedance of 50Ω.

ii) The strip-line capacitance

iii) The strip-line inductance. **(05 Marks)**

Module-4

7 a. Derive an expression and draw the field pattern for an array of 2 isotropic point sources with same amplitude and phase spaced $\lambda/2$ apart. **(08 Marks)**

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

c. A source has a radiation intensity pattern given by $U = U_m \cos\theta$ for $\theta \leq \theta \leq \pi/2$ and $0 \leq \phi \leq 2\pi$. Find the total power and directivity. **(04 Marks)**

OR

8 a. Derive an array factor expression in case of linear array of 'n' isotropic point source of equal amplitude and spacing. **(10 Marks)**

b. State and explain power theorem. **(05 Marks)**

c. Find the power radiated by a 10-cm dipole antenna operated at 50MHz with an average current of 5mA. How much (average) current would be needed to radiate power of 1W. **(05 Marks)**

Module-5

9 a. With neat diagram, explain the operation of log-periodic antenna. Write design equations. **(05 Marks)**

b. Obtain the expression for radiation resistance of small loop antenna. **(07 Marks)**

c. Determine the length L, H – plane aperture and flare angle θ_E and θ_H of a pyramidal horn for which the E – plane aperture $a_E = 10\lambda$. The horn is fed by a rectangular waveguide with TE_{10} mode. Let $\delta = 0.2\lambda$ in the E – plane and 0.375λ in the H – plane. Also find beam widths and directivity. **(08 Marks)**

OR

10 a. A 16-turn helical beam antenna has a circumference of λ and turn spacing of $\lambda/4$. Find : i) HPBW ii) Axial Ratio iii) Directivity. **(05 Marks)**

b. Discuss :

i) Helical Antenna

ii) Modern –version 6 – element Yagi – Uda antenna. **(08 Marks)**

c. Derive the expression for strength E_ϕ and H_ϕ in case of small loop. **(07 Marks)**

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17TE71

Seventh Semester B.E. Degree Examination, July/August 2022
Cryptography and Network Security

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 concept of divisibility and the division algorithm. **(10 Marks)**

b. State and prove Fermat's and Euler's theorem for public-key cryptography. **(10 Marks)**

OR

2 a. Construct the addition, multiplication and inverses table for Arithmetic in $GF(2^3)$. **(06 Marks)**

b. Mention the Modular Arithmetic Operation properties and prove the same. **(08 Marks)**

c. Explain the following terminologies:
(i) Symmetric Algorithms (ii) Asymmetric Algorithms **(06 Marks)**

Module-2

3 a. With a neat diagram, explain DES encryption process. **(10 Marks)**

b. Explain with a neat diagram the detailed structure of AES cipher. **(10 Marks)**

OR

4 a. Explain the Requirements of public-key cryptography. **(06 Marks)**

b. Describe the RSA algorithm with an example. **(08 Marks)**

c. Explain Elliptic curves over Zp. **(06 Marks)**

Module-3

5 a. Explain the concept of N-Hash with a neat diagram. **(10 Marks)**

b. Explain the following one-way hash functions using symmetric block algorithms:
(i) Tandem and Abreast Davies Meyer (ii) MDC-2 and MDC-4 **(10 Marks)**

OR

6 a. With a neat diagram, explain the operation Secure Hash Algorithm (SHA). **(10 Marks)**

b. Explain Discrete Logarithm Signature Schemes. **(10 Marks)**

Module-4

7 a. Give a comparision on Treats on the web. **(06 Marks)**

b. Explain the Record Protocol of Secure Sockets Layer (SSL). **(08 Marks)**

c. Explain the Alert codes supported by Transport Layer Security (TLS). **(06 Marks)**

OR

8 a. Explain the phase 1 (Establish Security Capabilities) of Handshake Protocol. **(10 Marks)**

b. Describe the concept of HTTPs. **(10 Marks)**

Module-5

9 a. Explain Pretty Good Privacy (PGP) for providing cryptographic functions like authentication, confidentiality and both with a neat diagram. **(10 Marks)**

b. What are the two databases of IP Security policy and explain them. **(10 Marks)**

OR

10 a. Illustrate the working of transport and tunnel mode Encapsulating Security Payload (ESP). **(10 Marks)**

b. With a neat diagram, describe Header and Payload Formats of Internet Key Exchange (IKE). **(10 Marks)**

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17EC72

Seventh Semester B.E. Degree Examination, July/August 2022
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 the fundamental steps in digital image processing. **(10 Marks)**

b. Explain various image sensing and acquisition methods. **(10 Marks)**

OR

2 a. Explain the process of image sampling and quantization in digital image processing. **(08 Marks)**

b. Explain the significance of isoference curve in an image processing. **(06 Marks)**

c. Consider the image segment shown in Fig.Q2(c). Let V = {1, 2} and compute the length of the shortest 4–, 8– and m-path between p and q. If particular path does not exist between these two points, explain why?

	3	1	2	1 (q)
	2	2	0	2
	1	2	1	1
(p)	1	0	1	2

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Explain the widely used gray level transformations. **(10 Marks)**

b. Perform histogram equalization of the image shown in Fig.Q3(b), where the intensity levels are integers in the range [0, 9].

$$\begin{bmatrix} 2 & 3 & 3 & 2 \\ 4 & 2 & 4 & 3 \\ 3 & 2 & 3 & 5 \\ 2 & 4 & 2 & 4 \end{bmatrix}$$

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

OR

4 a. Explain the development of digital Laplacian method used for image enhancement. **(10 Marks)**

b. Explain the procedure used in frequency domain for simultaneous gray level range compression and contrast enhancement. **(10 Marks)**

Module-3

5 a. Discuss how periodic noise can be reduced by frequency domain filtering. **(10 Marks)**

b. Explain the ordered statistic filter's used for image restoration. **(10 Marks)**

OR

6 a. Explain the following methods to estimate the degradation function used in image restoration:
(i) Estimation by image observation.
(ii) Estimation by experiment **(10 Marks)**

b. Explain the Weiner filtering method of restoring images in presence of noise and blur. **(10 Marks)**

Module-4

7 a. Explain the procedure in converting colors from HSI to RGB. **(10 Marks)**

b. Explain the relationship between scaling and wavelet function spaces. **(10 Marks)**

OR

8 a. Explain in brief the techniques used for pseudocolour image processing. **(10 Marks)**

b. Describe in brief the following terms:
(i) Morphological hit-or-miss transform
(ii) Morphological opening and closing. **(10 Marks)**

Module-5

9 a. Discuss various masks used to compute the gradient of an image. **(10 Marks)**

b. Explain region splitting and merging. **(10 Marks)**

OR

10 a. Explain the following image representation techniques:
(i) Signatures
(ii) Skeletons **(10 Marks)**

b. Discuss segmentation using morphological watersheds. **(10 Marks)**

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17EC73

Seventh Semester B.E. Degree Examination, July/August 2022
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 symbols and control characteristics of the following power semiconductor devices i) SCR ii) GTO iii) SITH iv) IGBT v) BJT. **(10 Marks)**

b. Explain different types of power electronics circuits and mention their applications. **(10 Marks)**

OR

2 a. Explain the switching characteristics of power BJT with the help of its transient model. **(10 Marks)**

b. Explain the operation of n-channel enhancement types MOSFET with its transfer characteristics. **(10 Marks)**

Module-2

3 a. Illustrate V-I characteristics of SCR with its different modes of operation. **(10 Marks)**

b. Describe turn on methods of SCR. **(04 Marks)**

c. Draw two transistor model of SCR and derive expression for anode current. **(06 Marks)**

OR

4 a. Define Communication. List the differences between Natural and Forced commutation. **(06 Marks)**

b. Describe the operation of SCR. Resistance firing circuit with neat circuit and waveforms. **(08 Marks)**

c. Explain Class – A commutation circuit with waveforms. **(06 Marks)**

Module-3

5 a. With circuit diagram, explain single phase full converter with RL load derive equation for average output voltage and rms output voltage. **(10 Marks)**

b. With neat diagram and waveforms, explain the principle of phase controlled converter operation. **(08 Marks)**

c. What is the role of freewheeling diode in controlled rectifiers with R-L load? **(02 Marks)**

OR

6 a. An ac voltage controller has resistance load R = 10Ω and root mean square input voltage (rms) is V_s = 120V, 60Hz. The thyristors switch is 'ON' for n = 25 cycles and is 'OFF' for m = 75 cycles. Calculate i) The rms output voltage V_0 ii) The input power factor (PF) iii) The average and rms current of thyristors. (Refer Fig Q6(a))

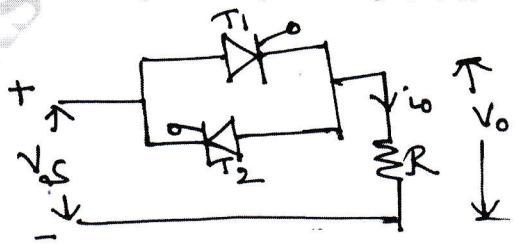

Fig Q6(a) **(06 Marks)**

b. Explain the principle of phase control, with the help of waveforms and obtain an expression for average value of output voltage. **(08 Marks)**

c. Explain the operation of a single phase bidirectional controller with resistive load and write an equation for rms output voltage. **(06 Marks)**

Module-4

7 a. The dc chopper has a resistive load R = 10Ω and the input voltage is V_s = 220V. When the convertor switch remains 'ON' its voltage drop is V_{ch} = 2V and the chopping frequency is f = 1KHz. It the duty cycle is 50%, calculate

i) The average output voltage
ii) The rms output voltage
iii) The converter efficiency
iv) The effective input resistance R_i of the converter **(10 Marks)**

b. Explain the operation of step down chopper with RL load and derive an expression for peak to peak load ripple current. **(10 Marks)**

OR

8 a. With the help of circuit diagram, explain four quadrant type E chopper. **(10 Marks)**

b. With the help of circuit diagram and waveforms, explain the operation of a Boost regulator. Derive the expression for peak – to – peak ripple current. **(10 Marks)**

Module-5

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

b. Give the comparison between Current Source Inverter (CSI) and Voltage Source Inverter (VSI). **(04 Marks)**

c. With circuit diagram, explain single phase bridge inverter. **(08 Marks)**

OR

10 a. Writ a short notes on

i) Single phase AC switches
ii) Solid state Relays **(10 Marks)**

b. Explain the working of variable dc-link inverter. **(10 Marks)**

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