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17EC71

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

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. Describe the mechanism of oscillations in case of Reflex klystron. **(07 Marks)**
 b. Give the solutions of Transmission line equations and find the expression for phase velocity. **(08 Marks)**
 c. A transmission line has following parameters R = 2Ω/m, G = 0.5mmho/m, f = 1GHz, L = 8nH/m, C = 0.23PF.
 Calculate:
   i) Characteristic impedance
   ii) Propagation Constant. **(05 Marks)**

2 a. Define reflection coefficient. Derive the equation for reflection coefficient at the load end at a dist "d" from the load. **(07 Marks)**
 b. Describe the different mode curve in the case of reflex klystron. **(07 Marks)**
 c. A transmission line has a characteristic impedance of $50 + j0.01\Omega$ and is terminated in a load impedance of $73 - j42.5\Omega$. Calculate:
   i) Reflection coefficient
   ii) Standing wave ratio. **(06 Marks)**

3 a. State and explain the properties of s-parameters. **(07 Marks)**
 b. Explain the working of precision type variable attenuator with a neat diagram. **(06 Marks)**
 c. Two transmission lines of characteristic impedance Z_1 and Z_2 are joined at plane PP'. Express s-parameters in terms of impedances. **(07 Marks)**

4 a. Draw the diagrams of coaxial connectors and explain. **(07 Marks)**
 b. Discuss E plane Tee. Derive its scattering matrix. **(06 Marks)**
 c. A 20mW signal is fed into one of 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. **(07 Marks)**

5 a. Find the Quality factor Q_d of microstrip lines. **(07 Marks)**
 b. Draw the diagram of parallel strip lines. Find the characteristic impedance of a lossless parallel strip lines. **(07 Marks)**
 c. Define the following :
 i) Antenna   ii) Beam efficiency   iii) Effective Aperture   iv) Directivity. **(06 Marks)**

6 a. Explain the concept of shielded strip line and co-planar strip lines with diagrams. **(07 Marks)**
 b. Define the following :
   i) Radiation pattern
   ii) Radiation Intensity
   iii) Gain
   iv) Effective Height. **(07 Marks)**

c. A radio link has a 15w transmitter connected to an antenna of 2.5m^2 effective aperture at 5GHz. The receiving antenna has effective aperture of 0.5m^2 and is located at a 15km line of sight distance from the transmitting antenna. Assuming lossless matched antennas, find the power delivered to the receiver. **(06 Marks)**

7 a. Explain power theorem and its application to an Isotropic source. **(07 Marks)**
   b. Explain the principle of pattern multiplication. **(07 Marks)**
   c. A source has a radiation intensity power pattern given by $U = U_m \sin^2\theta$ for $0 \le \theta \le \pi$; $0 \le \phi \le 2\pi$. Find the total power and directivity. Draw pattern. **(06 Marks)**

8 a. Derive the equation for radiation Intensity. Explain the concept of field patterns. **(07 Marks)**
   b. Find the radiation resistance of a $\dfrac{\lambda}{2}$ Antenna. **(07 Marks)**
   c. With diagram, explain the concept of Thin linear Antenna. **(06 Marks)**

9 a. Draw the diagram of a loop Antenna and explain. **(07 Marks)**
   b. Find the radiation resistance of loops, as related of Antenna. **(07 Marks)**
   c. Explain the working and design consideration of log periodic antenna. **(06 Marks)**

10 a. Explain the concept of Rectangular Horn Antenna. **(07 Marks)**
   b. Write short notes on :
      i) Yagi-uda Array   ii) Parabolic reflector. **(07 Marks)**
   c. A 16 turn helical beam Antenna has a circumference of λ and turn spacing of $\dfrac{\lambda}{4}$. Find
      i) HPBW   ii) Axial Ratio   iii) Directivity. **(06 Marks)**

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17EC72

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

Time: 3 hrs.

Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. Draw the block diagram of General Purpose image processing system and explain it.
(08 Marks)
   b. Explain the process of image sampling and quantization. **(08 Marks)**
   c. Let p and q are pixels at co-ordinates (10, 12) and (15, 20) respectively. Find the which distance measure gives minimum distance between them. **(04 Marks)**

2 a. Discuss the relationship between pixels in details. **(08 Marks)**
   b. Consider the image segment,

$$
\begin{array}{ccccc}
3 & 1 & 2 & ① & q \\
2 & 2 & 0 & 2 & \\
1 & 2 & 1 & 1 & \\
p & ① & 0 & 1 & 1 \\
\end{array}
$$

Let V = [0, 1], compute the length of 4, 8 and M path between p and q. If a particular path does not exist between p and q explain why? **(08 Marks)**
   c. Mention the applications of image. **(04 Marks)**

3 a. Explain the following intensity transformation functions:
      (i)   Image negatives.
      (ii)   Log transformation.
      (iii) Power law transformation. **(12 Marks)**
   b. Explain Bit plane slicing with example. **(08 Marks)**

4 a. With the block diagram, and mathematical equations, explain Homomorphic filtering.
(10 Marks)
   b. Explain the Butterworth LPF and Gaussian LPF for image smoothing. **(10 Marks)**

5 a. Discuss the most commonly used noise probability density functions in image processing applications. **(10 Marks)**
   b. Explain the following techniques used for noise removal in image processing:
      (i)   Arithmetic mean filter.   (ii)   Median filter **(10 Marks)**

6 a. Explain the followings for periodic noise reduction:
      (i)   Band rejection filters.
      (ii)   Band pass filters. **(10 Marks)**
   b. Discuss the three principal way to estimate the degradation function for use in image restoration. **(10 Marks)**

7 a. Discuss the following color models:
      (i)   RGB color model.
      (ii)   CMY model.
      (iii) HSI model **(15 Marks)**
   b. Given RGB = (0.683, 0.1608, 0.1922) convert this to HSI model. **(05 Marks)**

8   a.   Draw the block diagram of pseudo color processing and explain it.   (08 Marks)
    b.   Explain two dimensional four band filter band for subband image coding.   (08 Marks)
    c.   What is duality of a morphological image processing?   (04 Marks)

9   a.   Explain the following of image segmentation:
         (i)   Line detection
         (ii)   Edge detection.   (12 Marks)
    b.   Explain region Splitting and Merging.   (08 Marks)

10 a.   Explain the chain codes used to represent a boundary.   (08 Marks)
    b.   Write the Otsu's algorithm used for optimum global thresholding.   (08 Marks)
    c.   What is skeletons?   (04 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021
Power Electronics

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. Explain with a neat circuit and waveforms different types of power converters. **(10 Marks)**
   b. What are the peripheral effects of power electronic circuits? What are the remedies for them? **(06 Marks)**
   c. With circuit diagram, explain the control characteristics of, (i) SCR   (ii) MOSFET **(04 Marks)**

2 a. Draw the switching model of MOSFET and explain its switching characteristics. **(08 Marks)**
   b. The bipolar transistor is shown in Fig. Q2 (b) is specified to have β_F in the range of 8 to 40. The load resistance is $R_C = 11\,\Omega$. The DC supply voltage is $V_{CC} = 200$ V and the input voltage to the base circuit is $V_B = 10$ V. If $V_{CE(Sat)} = 1.0$ V and $V_{BE(Sat)} = 1.5$ V, find
      (i)   The value of R_B that results in saturation with an over drive factor of 5.
      (ii) The forced value of β.
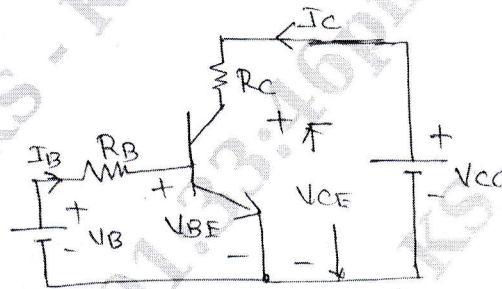   (iii) The power loss P_T in the transistor. **(08 Marks)**

Fig. Q2 (b)

   c. Explain the output characteristics of IGBT. **(04 Marks)**

3 a. Explain the two transistor model of SCR and also derive the expression for anode current of SCR with gate current. **(08 Marks)**
   b. The latching current of Thyristor shown in Fig.Q3 (b) is 50 mA. The Duration of firing pulse is 50 μs. Will the Thyristor get fired? **(04 Marks)**
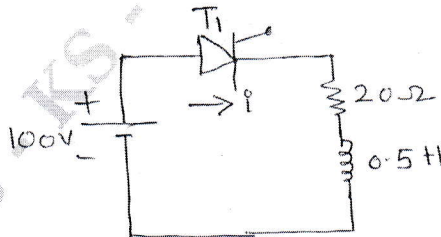

Fig. Q3 (b)

   c. Explain the various turn on methods of SCR. **(08 Marks)**

4 a. With a neat circuit and associated waveforms explain the operation of class B self commutation. **(08 Marks)**

b. Explain the operation of Resistance Capacitance (RC) fullwave trigger circuit with a neat circuit and waveforms. **(06 Marks)**

c. Design a UJT relaxation oscillator for triggering an SCR. The UJT has the following parameters:

$\eta = 0.7$, $I_P = 50 \ \mu A$, $V_V = 2 \ V$, $I_V = 6 \ mA$, $V_{BB} = 20 \ V$, $R_{BB} = 7 \ K\Omega$

The leakage current with emitter open is 2 mA. The triggering frequency is 1 kHz and $V_{g(min)} = 0.2V$. Assume C = 0.1 μF. **(06 Marks)**

5 a. With a neat circuit, associated waveforms explain the operation of a single phase full converter and show that the converter can operates in two quadrants by deriving the relevant expression. Assume highly inductive load with ripple free continuous load current. **(08 Marks)**

b. A single phase half-wave controlled converter is operated from 120 V, 50 Hz supply. Load resistance R = 10 Ω. If average output voltage is 25% of the maximum possible average output voltage determine (i) Firing angle (ii) Average and rms values of SCR currents. **(06 Marks)**

c. Explain the operation of a single phase dual converter with circulating current mode with a neat circuit diagram and waveforms. **(06 Marks)**

6 a. Compare on-off control with phase angle control as applied to AC voltage controllers. **(04 Marks)**

b. A single phase unidirectional AC voltage controller has a resistive load of R = 10 Ω and the input voltage is 120 V, 50 Hz. The delay angle of the thyristor is $\alpha = \dfrac{\pi}{2}$. Determine

    (i) The rms value of output voltage V_0.
    (ii) The input power factor.
    (iii) The average input current.
    (iv) The average output current. **(08 Marks)**

c. With neat circuit diagram and waveforms, explain the operation of single phase bidirectional AC voltage controller for resistive load. Derive the equation for rms output voltage. **(08 Marks)**

7 a. Explain the working principle of step down chopper with resistive load. With neat circuit and associated waveforms. Derive the equation for, (i) rms output voltage (ii) Effective input resistance in terms of chopper duty cycle. **(08 Marks)**

b. Classify the chopper and explain each classification in brief with circuit diagrams. **(08 Marks)**

c. Explain the performance parameters of choppers. **(04 Marks)**

8 a. With a neat circuit and waveforms explain the working of Buck regulator. (10 Marks)

b. A boost regulator shown in Fig. Q8 (b) has an input voltage of $V_S = 5$ V. The average output voltage $V_a = 15$ V and the average load current $I_a = 0.5$ A. The switching frequency is 25 kHz. If $L = 150$ μH and $C = 220$ μF. Determine

    (i) The duty cycle K.

    (ii) The ripple current of inductor ΔI.

    (iii) The ripple voltage of filter capacitor ΔV_C.

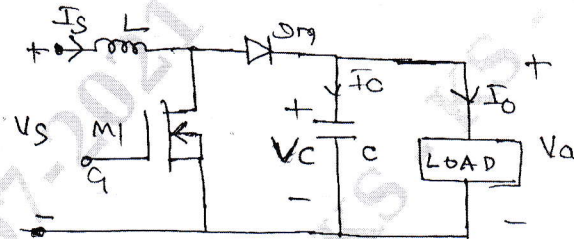   (iv) The critical values of L and C. (10 Marks)

Fig. Q8 (b)

9 a. What do you mean by Inverter? Explain the operation of single phase half bridge inverter, with neat circuit and waveforms. (08 Marks)

b. The single phase full bridge inverter has a resistive load of $R = 2.4$ Ω and the dc input voltage is $V_s = 48$ V. Determine

    (i) The rms output voltage at the fundamental frequency V_{01}.

    (ii) The output power P_0.

    (iii) The average and peak currents of each transistor.

    (iv) The peak reverse blocking voltage V_{BR} of each transistor. (06 Marks)

c. Explain the performance parameters of inverter. (06 Marks)

10 a. With a neat circuit, explain the variable DC link inverter. (06 Marks)

b. Explain single phase AC switches. (07 Marks)

c. Explain solid state relays. (07 Marks)

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Seventh Semester B.E. Degree Examination, July/August 2021
Multimedia Communication

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions.

1   a. Illustrate broadcast television networks with relevant diagram.   (06 Marks)
    b. Explain interactive application over the internet with neat diagram.   (08 Marks)
    c. Explain the QOS parameters associated with circuit switched networks.   (06 Marks)

2   a. Write notes on: (i) Movie on demand   (ii) Near movie on demand   (06 Marks)
    b. Illustrate connection oriented packet switched network with relevant diagram.   (08 Marks)
    c. A packet switched network with a worst case jitter of 10 ms. Determine the minimum
        amount of memory that is required at the destination and a suitable packet size for each of
        the following input bit rates (i) 64 kbps   (ii) 256 kbps   (iii) 1.5 Mbps   (06 Marks)

3   a. Design a basic signal encoder with circuit components and associated waveforms. (08 Marks)
    b. Discuss the following with relevant diagrams: (i) Additive mixing (ii) Subtractive mixing
                                                                                 (04 Marks)
    c. Explain the following HDTV formats with bit rates : (i) SIF   (ii) QCIF (08 Marks)

4   a. Write a note on CD quality audio.   (04 Marks)
    b. Derive the bit rate and memory requirements to store each frame that result from the
        digitization of both a 525 line and a 625 line system assuming a 4:2:2 format. Also find the
        total memory required to store a 2 hour movie/video.   (08 Marks)
    c. Explain the basic principle of PCM signal encoder/decoder with relevant waveforms.
                                                                                 (08 Marks)

5   a. Explain the following image compression techniques: (i) GIF   (ii) TIFF (06 Marks)
    b. Write a note on Resource Management of DMS.   (04 Marks)
    c. Explain the necessary steps involved in JPEG encoder with neat diagram. (10 Marks)

6   a. Explain the following with respect to multimedia operating systems:
        (i) CPU management   (ii) Memory Management   (iii) IO Management   (06 Marks)
    b. Illustrate arithmetic coding for the encoding of the string [went .]. Assume the probability of
        a string of characters e = 0.3, n = 0.3, t = 0.2, w = 0.1 and · = 0.1.   (08 Marks)
    c. Explain RSVP architecture with neat diagram.   (06 Marks)

7   a. Explain ADPCM with neat diagram.   (08 Marks)
    b. Illustrate B-frame encoding procedure with relevant diagram.   (08 Marks)
    c. Write a note on H.263.   (04 Marks)

8 a. Explain MPEG-1 video bit stream structure with necessary composition and frame format.

(08 Marks)

   b. Explain LPC signal encoder/decoder with neat diagram.

(08 Marks)

   c. Explain scene composition used in MPEG-4.

(04 Marks)

9 a. Illustrate basic reconstruction approaches used in packet voice with advantages and disadvantages.

(06 Marks)

   b. Write a note on error resilient encoding.

(04 Marks)

   c. Explain different multiplexing schemes used in ATM networks.

(10 Marks)

10 a. Explain scalable rate control with neat block diagram.

(10 Marks)

   b. Explain the concept of layered video coding with relevant diagrams.

(06 Marks)

   c. Write a note on packet video.

(04 Marks)

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17TE71

Seventh Semester B.E. Degree Examination, July/August 2021
Cryptography and Network Security

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions.*

1   a. Explain the Euclid's algorithm for determining the GCD of two positive integers. Find the GCD of (1970, 1066) using Euclid's algorithm.   **(10 Marks)**
    b. Briefly explain the following with examples :
       i) play fair
       ii) (2×2) Hill ciphers.   **(10 Marks)**

2   a. Define modular arithmetic operation with necessary properties and prove the same.
                                                                                                 (10 Marks)
    b. Describe simple XOR and one time pad encryption techniques with an example and its difficulties.   **(10 Marks)**

3   a. Illustrate the following with necessary diagrams :
       i) Feistel encryption and decryption process
       ii) Single DES encryption.   **(12 Marks)**
    b. Explain the process of AES encryption with necessary diagram.   **(08 Marks)**

4   a. Briefly explain RSA algorithm with example.   **(06 Marks)**
    b. Illustrate the diffie – Hellman key exchange algorithm with example.   **(06 Marks)**
    c. With the help of neat diagram, explain elliptic curve Arithmetic and Rules.   **(08 Marks)**

5   a. Differentiate between MD4 and MD5 algorithm.   **(06 Marks)**
    b. Outline N-Hash algorithm with neat diagram.   **(06 Marks)**
    c. Explain discrete logarithmic signature scheme.   **(08 Marks)**

6   a. With the neat diagram, explain the operation of Secure Hash Algorithm (SHA).   **(08 Marks)**
    b. Explain DSA algorithm with necessary diagram and required example.   **(12 Marks)**

7   a. With necessary diagram, explain the SSH protocol stack layers.   **(07 Marks)**
    b. Explain SSL protocol stack with session state and connection status parameters.   **(07 Marks)**
    c. With neat flow diagram, explain IEEE802.11i phases of operation.   **(06 Marks)**

8 a. Explain SSH transport layer protocol packets exchange and packet formation with required diagram. **(08 Marks)**
   b. Explain all the services and protocols of IEEE 802.11i WLAN with necessary diagram.
       (12 Marks)

9 a. Explain PGP cryptographic functions with relevant diagram. **(10 Marks)**
   b. Explain the concept of combining security associations internet key exchange with necessary diagrams. **(10 Marks)**

10 a. Describe the cryptographic algorithm used in S/MIME. **(08 Marks)**
    b. With relevant diagram, explain all the fields involved in ESP packet. **(06 Marks)**
    c. With neat diagram, explain typical scenario of IP security with its applications. **(06 Marks)**

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