CBCS SCHEME

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15EC71

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Microwaves and Antennas

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive the general transmission line equation to find voltage and current on the line interms of position 'z' and time 't'. **(07 Marks)**

b. Describe the different mode curve in the case of reflex klystron. **(05 Marks)**

c. A transmission line has a characteristic impedance of 50 + j0.01Ω and terminated in a load impedance of 73 – j42.5Ω calculate : i) reflection coefficient ii) SWR. **(04 Marks)**

OR

2 a. Define relection coefficient. Derive the equation for reflection coefficient at the load end at a distance 'd' from the load. **(06 Marks)**

b. Describe the mechanism of oscillation of reflex klystron. **(06 Marks)**

c. A transmission line has the following parameters : R = 2Ω/m, G = 0.5mmho/m, f = 1GHz, L = 8nH/m, C = 0.23pF/m. Calculate : i) characteristic impedance ii) propagation constant. **(04 Marks)**

Module-2

3 a. State and explain the properties of S – matrix. **(07 Marks)**

b. With a neat diagram, explain the working of precession type variable attenuator. **(06 Marks)**

c. 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. **(03 Marks)**

OR

4 a. What is magic Tee? Derive its scattering matrix. **(06 Marks)**

b. Discuss different types of coaxial connectors. **(04 Marks)**

c. 2 transmission lines of characteristic impedance Z_1 and Z_2 are joined at plane PP'. Express S–parameters in terms of impedance when each line is matched terminated. **(06 Marks)**

Module-3

5 a. Explain the construction and field pattern for microstrip line. **(06 Marks)**

b. Explain the following terms as related to antenna system :
i) directivity ii) beam efficiency iii) effective aperture. **(06 Marks)**

c. The effective apertures of transmitting and receiving antennas in a communication system are $8\lambda^2$ and $12\lambda^2$ respectively. With a separation of 1.5km between them. The EM wave travelling with frequency of 6 MHz and the total input power is 25KW. Find the power received by the receiving antenna. **(04 Marks)**

OR

6 a. Explain co-planar strip line and shielded strip line. **(06 Marks)**

b. Write a note on antenna field zones. **(06 Marks)**

c. An antenna has a field pattern given by $E(\theta) = \cos^2\theta$ for $0 \le \theta \le \pi/2$. Find the beam area and directivity. **(04 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. **(06 Marks)**

b. Show that the radiation resistance of $\lambda/2$ antenna is 73Ω. **(06 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. **(04 Marks)**

OR

8 a. Derive the expressions for the far field components of short dipole. **(06 Marks)**

b. Explain the principle of pattern multiplication with an example. **(06 Marks)**

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

Module-5

9 a. Derive the expression for strength $E\phi$ and $H\theta$ in case of small loop. **(06 Marks)**

b. Explain the working and design considerations of Log-periodic antenna. **(06 Marks)**

c. 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. **(04 Marks)**

OR

10 a. Show that the radiation resistance of small loop is $31171\left(\frac{A}{\lambda^2}\right)^2$. **(05 Marks)**

b. Write a short notes on :
i) Yagi Uda array ii) parabolic reflector. **(06 Marks)**

c. Determine the length L, H-plane aperture and flare angles θ_E and θ_H of a pyramidal horn for which the E-plane aperture $a_E = 10\lambda$. Let $\delta = 0.2\lambda$ in the E-plane and 0.375λ in the H-plane. Also determine beam widths and directivity. **(05 Marks)**

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15EC72

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Digital Image Processing

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. What is digital image? Explain the fundamental steps of digital image processing. **(08 Marks)**

b. Explain the concept of sampling and quantization of an image. **(06 Marks)**

c. Mention any four fields that use digital image processing. **(02 Marks)**

OR

2 a. Explain with neat diagram, how image is acquired using senstor strips? **(08 Marks)**

b. Define 4-, 8- and m-adjacency. Compute the lengths of the shortest 4-, 8- and m-path between p and q in the image segment shown in Fig. Q2 (b) by considering $V = \{2, 3, 4\}$ **(06 Marks)**

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

Fig. Q2 (b)

c. A common measure of transmission for digital data is the baud rate defined as the number of bits transmitted per second. Generally, transmission is accomplished in packets consisting of a start bit, a byte (8 bits) of information and a stop bit. Using these facts find how many minutes would it take to transmit a 2048×2048 image with 256 intensity levels using a 33.6 K baud modem? **(02 Marks)**

Module-2

3 a. For a given 4×4 image having gray scales between [0, 9] perform histogram equalization and draw the histogram of image before and after equalization. 4×4 image is shown in Fig. Q3 (a). **(08 Marks)**

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

Fig. Q3 (a)

b. Explain smoothing of images in frequency domain using ideal, Butterworth and Gaussian Low pass filter. **(08 Marks)**

OR

4 a. Define 2D DFT- with respect to 2D DFT of an image and state the following properties:
(i) Translation (ii) Rotation (iii) Periodicity (iv) Convolution theorem. **(05 Marks)**

b. With necessary graphs, explain the log and power law transformation used for spatial image enhancement. **(05 Marks)**

c. Explain image sharpening in spatial domain using second order Laplacian derivative. **(06 Marks)**

Module-3

5 a. With necessary equations and graph, explain any four noise probability density functions. **(08 Marks)**

b. Explain minimum mean square error filtering method of restoring images. **(08 Marks)**

OR

6 a. Explain how image degradation is estimated using,
(i) Observation (ii) Mathematical modeling. **(08 Marks)**

b. Explain the order statistics filters used for restoring images in the presence of noise. **(08 Marks)**

Module-4

7 a. Write the equations for converting colors from HSI to RGB. **(06 Marks)**

b. Write H matrix for Haar transform for N = 4 and explain how it is constructed. **(04 Marks)**

c. Explain the following morphological algorithms:
(i) Thinning (ii) Thickening. **(06 Marks)**

OR

8 a. What is Pseudo color image processing? Explain intensity slicing as applied to pseudo color image processing. **(07 Marks)**

b. Explain Erosion and Dilation operations used for morphological processing. **(07 Marks)**

c. Define wavelet function. **(02 Marks)**

Module-5

9 a. Explain Marr-Hildreth edge detector. **(10 Marks)**

b. Write short note on Boundary segments. **(06 Marks)**

OR

10 a. Explain the following boundary descriptors: (i) Shape numbers (ii) Fourier descriptors. **(08 Marks)**

b. Explain Global Thresholding using Otsu's method. **(08 Marks)**

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15EC73

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Mention and explain the different types of power electronic converter systems. Draw their output/input characteristics. **(08 Marks)**

b. With neat waveforms and switching nodel, explain the switching characteristics of power MOSFET. **(08 Marks)**

OR

2 a. The bi-polar transistor in below figure – 2(a) 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 $V_{cc} = 200V$ and the input voltage to the base circuit is $V_B = 10V$. If $V_{CE(sat)} = 1V$ and $V_{BE(sat)} = 1.5$ V, find
i) The value of R_B that results in saturation with an ODF of 5
ii) β_{forced} iii) Power loss P_T in transistor.

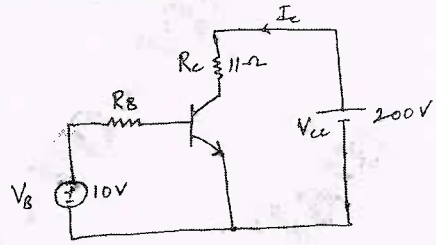

Fig Q2(a) **(08 Marks)**

b. Explain di/dt and dv/dt limitation in power converters.
A BJT is operated as a chopper switch at a frequency of $f_s = 10$ KHz. The dc voltage of the chopper is $V_s = 220$ V and the load current is $I_L = 100A$. The switching times are $t_d = 0$, $t_r = 3\mu s$ and $t_f = 1.2\ \mu s$.
Determine: i) The values of L_s, C_s and R_s for critically damped conditions.
ii) Rs, if the discharge time is limited to $1/3^{rd}$ of the switching period.
iii) Rs, if the peak discharge current is limited to 10% of the load current
iv) Power loss due to R-C snubber P_s neglecting the effect of inductor L_s on the voltage of snubber capacitor C_s. Also assume that $V_{CE(sat)} = \phi$ V **(08 Marks)**

Module-2

3 a. In detail explain the two transistor model of a thyristor. **(08 Marks)**

b. Mention and explain different thyristor turn-on methods. Mention the advantages of gate triggering. **(08 Marks)**

OR

4 a. Explain dynamic turn – off characteristics of SCR.
For R – triggering circuit, the gate voltage required to trigger the SCR is $V_{GT} = 0.6V$ and corresponding $I_{GT} = 250\mu A$. The silicon diode is used and input voltage is V = 100 sin wt. Find firing angle α if $R_1 = 10k\Omega$ and $R_2 = 220k\Omega$. **(08 Marks)**

b. Explain uJT relaxation oscillator and design uJT firing circuit using an uJT having the parameters $\eta = 0.72$, $I_P = 60\mu A$, valley voltage $V_V = 2.5$ V, $I_V = 4mA$, $V_{BB} = 15V$ and $R_{BB} = 5k\Omega$. The leakage current with emitter open is 3mA. The triggering frequency is 1kHz and $V_{g(min)} = 0.3V$. Also calculate the minimum and maximum values of triggering frequency. Assume $C = 0.05\mu F$. **(08 Marks)**

Module-3

5 a. With the help of neat circuit diagram describe the operation of a single phase full converter with R.L load. Draw the associated waveforms. Derive expressions for rms and average output voltages. **(08 Marks)**

b. A single phase half wave converter is operated from 120V, 60Hz supply. If the load is resistive with R = 10Ω, and the delay angle is α = 60°, calculate efficiency, FF, TUF. Also derive the equations for rms and average output voltages. **(08 Marks)**

OR

6 a. With neat circuit diagram and waveforms, explain the principle of phase angle control in AC voltage controller. Derive the equations for rms and average output voltages. **(08 Marks)**

b. A single phase half wave ac voltage controller has an input voltage of 150V and a load resistance of 8Ω. The firing angle of thyristor is 60° in each positive half cycle. Find :

i) Average output voltage ii) RMS output voltage iii) Power output
iv) Power factor (pf) v) Average input current over one cycle. **(08 Marks)**

Module-4

7 a. Classify the choppers and explain the different types and chopper circuits. **(08 Marks)**

b. Obtain an expression for the output voltage for a step-up chopper. A dc chopper has an input voltage of 200V and a load of 8Ω resistance. The voltage drop across thyristor is 2V and the chopper frequency is 800Hz. The duty cycle α = 0.4. Find
i) Average output voltage ii) rms output voltage iii) Chopper efficiency. **(08 Marks)**

OR

8 a. In detail explain buck regulator. **(08 Marks)**

b. The buck regulator shown in figure Q8 (b) has an input voltage of V_s = 12V. The required average output voltage is V_a = 5V at R = 500Ω and peak – to – peak output ripple voltage is 20mV. The switching frequency is 25kHZ. The peak – to – peak ripple current of inductor is limited to 0.8A, determine :
i) The duty cycle, K ii) The filter inductance, L iii) The filter capacitor, C
iv) The critical values of L and C.

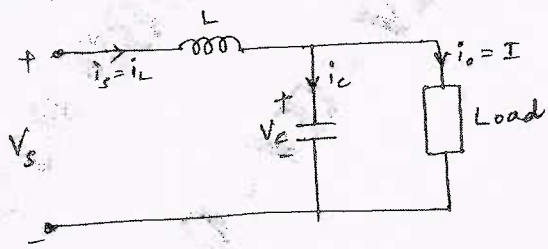

Fig Q8(b) **(08 Marks)**

Module-5

9 a. What do you mean by inverters? Explain the operation of single phase full bride inverter. Draw the load current waveforms for R, RL and RLC loads. **(08 Marks)**

b. Mention the applications of current source inverters. Explain any one type of single phase current source inverter. **(08 Marks)**

OR

10 a. Explain solid state relays. **(08 Marks)**

b. Explain microelectronic relays. **(08 Marks)**

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15EC743

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Real Time Systems

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define real time system. Classify them based on time constraints. **(06 Marks)**
b. Explain the different types of programs in system design. **(10 Marks)**

OR

2 a. Explain briefly sequence control with neat diagram. **(06 Marks)**
b. What is DDC? Explain with block diagram. **(06 Marks)**
c. Write a short note on hierarchical system. **(04 Marks)**

Module-2

3 a. What is necessity of using specialized processors in RTS? **(04 Marks)**
b. Explain the different forms of parallel computer architectures. **(12 Marks)**

OR

4 a. Explain digital input and output interface. **(08 Marks)**
b. Explain the basic interrupt input mechanism with diagram and flowchart. **(08 Marks)**

Module-3

5 a. List and explain various requirements in programming languages used in real-time applications. **(08 Marks)**
b. Explain briefly declaration and initialization of variables and constants. **(08 Marks)**

OR

6 a. What are the data types? Explain each one briefly. **(10 Marks)**
b. Write short notes on overview of real time languages. **(06 Marks)**

Module-4

7 a. Explain with neat diagram structures of RTOS. **(08 Marks)**
b. Explain cyclic and preemptive scheduling strategies. **(08 Marks)**

OR

8 a. Draw and explain task state diagram. **(08 Marks)**
b. Explain the general structures of Input Output Sub System (IOSS) **(08 Marks)**

Module-5

9 a. With neat flow-chart describe single program approach with reference to RTS design. **(08 Marks)**
b. Explain software design of RTS using software module. **(08 Marks)**

OR

10 a. Explain the outline of abstract modeling approach of ward and Mellor. **(10 Marks)**
b. Write a short note on YOURDON-METHODOLOGY. **(06 Marks)**

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15EC744

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Cryptography

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 Euclid's algorithm for determining the GCD of two positive integers. Find the GCD of (1970, 1066) using Euclid's algorithm. **(08 Marks)**

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

OR

2 a. Explain the extended Euclid's Algorithm for determining the GCD and multiplicative inverse of two integers. **(08 Marks)**

b. Find gcd [a(x), b(x)] for $a(x) = x^6 + x^5 + x^4 + x^3 + x^2 + x + 1$ and $b(x) = x^4 + x^2 + x + 1$. **(08 Marks)**

Module-2

3 a. Draw the model of symmetric cryptosystem and explain it. **(08 Marks)**

b. Explain playfair Cipher and its rules for the following example:
Ex: Keyword : "Computer"
Plaintext : "parrot" **(08 Marks)**

OR

4 a. Using Hill Cipher technique encrypt and decrypt the plain text "crypto" using the key $K = \begin{pmatrix} 7 & 8 \\ 11 & 11 \end{pmatrix}$. **(08 Marks)**

b. With a neat block diagram, explain general depiction of DES encryption algorithm. **(08 Marks)**

Module-3

5 a. Explain with a neat diagram of AES encryption process. **(08 Marks)**

b. Explain AES key expansion algorithm. **(08 Marks)**

OR

6 a. Explain linear feedback shift registers with necessary diagrams. **(08 Marks)**

b. Explain the following with necessary diagrams:
i) Generalized Geffe Generator
ii) Threshold Generator. **(08 Marks)**

Module-4

7 a. State and prove Fermat's Theorem. Also find 3^{201} mod 11 using it. **(08 Marks)**

b. Explain Chinese Remainder Theorem. By using CRT, find 'x' for the following:

$x \equiv 2 \pmod 3$

$x \equiv 3 \pmod 5$

$x \equiv 2 \pmod 7$. **(08 Marks)**

OR

8 a. Explain elaborately Diffie-Hellman key exchange algorithm. **(05 Marks)**

b. Perform encryption and decryption using RSA algorithm for p = 3, q = 11, e = 7 and M = 5. **(06 Marks)**

c. Explain Elliptic curve over real numbers. **(05 Marks)**

Module-5

9 a. Explain the concept of N-Hash algorithm with a neat diagram. **(08 Marks)**

b. With the neat diagram, explain the operation of Secure Hash Algorithm (SHA). **(08 Marks)**

OR

10 a. What are the criticisms against DSA, explain in brief. **(08 Marks)**

b. Explain Discrete Logarithm Signature schemes. **(08 Marks)**

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15EC751

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
DSP Algorithms and Architecture

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define LTI system. **(04 Marks)**

b. Evaluate in detail decimation and interpolation process with neat block diagram and necessary equations. **(06 Marks)**

c. Determine the interpolated sequence y(m) with input sequence x(n) = [0, 3, 6, 9] using interpolation sequence $b_k = \left[\frac{1}{3}, \frac{2}{3}, \frac{3}{3}, \frac{2}{3}, \frac{1}{3}\right]$ and interpolation factor of 3. **(06 Marks)**

OR

2 a. Define Dynamic range and resolution. **(04 Marks)**

b. Interpret the D/A converter error due to zero order hold at its output. **(06 Marks)**

c. Calculate the Dynamic range and percentage resolution of each of the following number representation formats.

i) 24-bit, single precision, fixed point format.

ii) 48-bit, double precision fixed point format

iii) A floating point format with a 16-bit mantissa and an 8-bit exponent. **(06 Marks)**

Module-2

3 a. What is Barrel shifter? **(04 Marks)**

b. Build 4×4 Barman multiplier. **(06 Marks)**

c. Analyze circular addressing mode algorithm. **(06 Marks)**

OR

4 a. Analyze MAC unit. **(04 Marks)**

b. Elaborate the importance of saturation logic and Guard bits used in MAC unit. **(06 Marks)**

c. Analyze the importance of parallelism and pipelining used in programmable DSP with the help of 8-tap FIR Filter. **(06 Marks)**

Module-3

5 a. Distinguish the architectural features of three fixed point DSPs. **(08 Marks)**

b. Sketch the functional diagram of ALU of TMS320C54XX DSP and briefly explain. **(08 Marks)**

OR

6 a. Describe the operation of Hardware timer with a neat diagram. **(08 Marks)**

b. Write an ALP of TMS320C54XX processor to compute the sum of three product terms given by an equation.
$y(n) = h_0\, x(n) + h_1\, x(n-1) + h_2\, x(n-2)$ using MAC instruction. **(08 Marks)**

Module-4

7 a. Implement the block diagram of FIR Filter and briefly explain. **(04 Marks)**
b. Sketch the block diagram for second order IIR Filter and briefly explain. **(04 Marks)**
c. Write a program to multiply two Q15 numbers. **(08 Marks)**

OR

8 a. Derive the equations to implement a butterfly structure in DITFFT algorithm. **(04 Marks)**
b. Write the subroutine for bit reversed order. **(04 Marks)**
c. Develop the subroutine to implement butterfly computation. **(08 Marks)**

Module-5

9 a. Describe DMA with respect to TMS320C54XX processor. **(08 Marks)**
b. Interface data memory system with the address range 000800H000FFFH for TMS320C5416 processor. Use 2K×8 SRAM memory chips. **(08 Marks)**

OR

10 a. With a neat block diagram, explain the synchronous serial interface between TMS320C54XX and CoDEC device. **(08 Marks)**
b. Explain the DSP based biotelemetry Receiver system with a neat block diagram. **(08 Marks)**

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15EC71

Seventh Semester B.E. Degree Examination, June/July 2019
Microwave and Antennas

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Discuss mechanism of oscillation in Reflex Klystron with schematic. **(06 Marks)**

b. A Reflex Klystron is to be operated at 10GHz with dc beam voltage 300V, repeller space 0.1cm for $1\frac{3}{4}$ mode. Calculate P_{RFmax} and corresponding repeller voltage for a beam current of 20mA. **(05 Marks)**

c. A transmission line has the following parameters:
R = 2Ω/m, G = 0.5mho/m, f = 1GHz, L = 8nH/m and C = 0.23 PF.
Calculate its characteristics impedance and propagation constant. **(05 Marks)**

OR

2 a. A line of 400Ω is connected to a load of 200 + j300Ω which is excited by a matched generator at 800MHz. Find the location and length of a single stub nearest to the load to produce an impedance match. **(08 Marks)**

b. A certain transmission line has a characteristic impedance of 75 + j0.01Ω and is terminated in a load impedance of 75 + j50Ω. Compute: i) Reflection coefficient ii) The transmission coefficient. **(04 Marks)**

c. What are the high frequency limitations of conventional vacuum tube / transistors? **(04 Marks)**

Module-2

3 a. Show that impedance and admittance matrices are symmetrical for a reciprocal junction. **(06 Marks)**

b. In a H-plane T-junction, compute power delivered to the loads 40ohm and 60ohm connected to arms 1 and 2 when 10mw power is delivered to matched port 3. Assume characteristics impedance of line = 50ohm. **(04 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. **(06 Marks)**

OR

4 a. Discuss the following properties of S-parameters:
i) Symmetry of [S] for a reciprocal network
ii) Unitary property for a lossless junction. **(08 Marks)**

b. A magic T is terminated at collinear ports 1 and 2 and difference port 4 by impedances of reflection coefficients $\gamma_1 = 0.5$, $\gamma_2 = 0.6$ and $\gamma_4 = 0.8$ respectively. If 1W power is fed at sum port 3, calculate the power reflected at port 3 and power transmitted to other three ports. **(08 Marks)**

Module-3

5 a. 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. **(04 Marks)**

b. Discuss different types of losses in microstrip lines. **(06 Marks)**

c. Calculate the exact directivity for 3 dimensional source having the pattern $U = U_m \sin^2\theta \sin^3\phi$ where $0 \le \theta \le \pi$, $0 \le \phi \le \pi$. **(06 Marks)**

OR

6 a. Show that maximum effective aperture of a $\lambda/2$ depole antenna is $0.13\lambda^2$. **(06 Marks)**

b. With the aid of schematic diagram explain coplanar strip line. **(05 Marks)**

c. Compute the power received by receiving antenna kept at a distance of 100km by a transmitter radiating at 3MHz. Assume $G_T = 40$ and $G_R = 15$ and $P_T = 1000$ kW. Derive the relation used. **(05 Marks)**

Module-4

7 a. Obtain the fields pattern for two point source situated symmetrically with respect to the origin. Two sources are feed with equal amplitude and equal phase signals. Assume distance between two sources = $\lambda/2$. **(08 Marks)**

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

OR

8 a. Derive an array factor expression in case of linear array of 'n' isotropic point source of equal amplitude and spacing. **(08 Marks)**

b. Obtain the expression for field of dipole in general for the case of thin linear antenna. **(08 Marks)**

Module-5

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

b. With neat diagram explain the operation of log-periodic antenna. **(08 Marks)**

OR

10 a. Determine the length L_1 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 what are beam widths and what is the directivity. **(08 Marks)**

b. Discuss the following antenna types (i) Helical Antenna (ii) Yagi-uda-array. **(08 Marks)**

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CBCS SCHEME

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15EC72

Seventh Semester B.E. Degree Examination, June/July 2019
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. Mention thematic bands in NASA's LANDSAT satellite, its wavelength and uses. **(05 Marks)**

b. Consider the image segment shown in Table. Q1(b), compute the length of the shortest 4, 8 and m-path between P and Q for (i) V = {2, 3, 4}. **(06 Marks)**

	3	4	1	2	0
	0	1	0	4	② Q
	2	2	3	1	4
P	③	0	4	2	1

c. Explain the process of image acquisition using single sensor with motion to generate a 2 - D image. **(05 Marks)**

OR

2 a. Explain the process of generating a digital image. **(05 Marks)**

b. Discuss the most commonly used distance measures in image processing. **(06 Marks)**

c. With the mathematical equation, explain the bicubic interpolation. **(05 Marks)**

Module-2

3 Explain the following intensity transformation functions :

a. Image negatives **(05 Marks)**

b. Log transformation **(05 Marks)**

c. Power – law transformation. **(06 Marks)**

OR

4 a. For the given 4 × 4 image of Table Q4(a) having gray scale between 0 to 9, perform histogram equalization and draw the histogram of image before and after equalization. **(08 Marks)**

2	3	3	2
4	2	4	3
3	2	3	5
2	4	2	4

Table. Q4(a)

b. Explain the image smoothing in frequency domain using ideal low pass filter. **(08 Marks)**

Module-3

5 a. What are the most commonly used probability density functions in image processing applications and explain it with the help of plot. (08 Marks)

b. With the mathematical equations, discuss the minimum Mean Square Error Filtering. (08 Marks)

OR

6 a. Explain the process of restoration in the presence of noise only using spatial filtering for various mean filters. (08 Marks)

b. What are the three principal ways to estimate the degradation function for use in image restoration and explain it? (08 Marks)

Module-4

7 a. Explain the process of generating RGB image. (08 Marks)

b. Write the formulas used for converting RGB to HSI. Using these formula find the value of HSI for the given RGB = (0.683, 0.1608, 0.1922). (08 Marks)

OR

8 a. Draw the block diagram for converting gray level intensity to color transformation and explain it. (08 Marks)

b. What is image pyramids? Explain the system for creating approximation and prediction residual pyramids. (08 Marks)

Module-5

9 a. Explain image gradient and gradient operators for Edge detection. (08 Marks)

b. Discuss the process of region splitting and merging for region based segmentation. (08 Marks)

OR

10 a. Write the steps to be followed for developing algorithm for a given binary region R and example it. (08 Marks)

b. Mention the aberrations of Minimum Perimeter Polygons (MPP) algorithm and explain it. (08 Marks)

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15EC73

Seventh Semester B.E. Degree Examination, June/July 2019
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. Explain the control characteristics of various power devices. **(08 Marks)**

b. Explain the various types of power electronic circuits along with suitable waveforms. **(08 Marks)**

OR

2 a. Explain the construction, working and steady state characteristics of n-channel enhancement MOSFET. **(08 Marks)**

b. With the help of neat circuit diagram and relevant waveforms, explain the transient characteristics of BJT. **(08 Marks)**

Module-2

3 a. Explain two transistor analogy of SCR. Using two transistor analogy derive the expression for anode current interms of gate current. **(08 Marks)**

b. With the help of suitable circuit and relevant waveforms, explain the following turn-OFF methods of SCR.
i) Natural commutation
ii) Class-A commutation with series load
iii) Class-A commutation with the load in parallel
iv) Class-B commutation **(08 Marks)**

OR

4 a. An SCR has $\frac{di}{dt}$ rating of 100 A/μs and $\frac{dv}{dt}$ rating of 50 V/μs. Design a protection circuit for SCR using a supply of 200 V. The load current is 20 A. **(04 Marks)**

b. Using UJT triggering circuit, it is required to design a triggering circuit for the SCR so that the triggering angle can be varied for 20° to 120°. The supply voltage is 100 sin ωt. The intrinsic stand-off ratio of UJT is 0.6. **(06 Marks)**

c. Draw the circuit of R-C triggering of SCR, explain the circuit operation and sketch the relevant waveforms. **(06 Marks)**

Module-3

5 a. A single phase full converter is connected to a supply of $(\sqrt{2} * 120)$ sin $2\pi * 50t$. The triggering angle of the SCR is 60°. The load inductance is very large. Calculate (i) DC of output voltage (ii) rms output voltage (iii) Harmonic fact (HF) (iv) Input power factor (v) rms value of fundamental component of supply current. Take the load current as 10A. **(08 Marks)**

b. A DC motor is used in an electric train. The DC motor is controlled by a power electronic circuit. It is required that the power electronic circuit should be capable of operating the DC motor in all four quadrant of operation. Draw the necessary circuit, explain its operation along with waveforms and derive the expression for DC o/p voltage. **(08 Marks)**

OR

6 a. A single phase full-wave AC voltage controller delivers an output power of 719.95 W to a load of 10Ω. The input voltage is $V_s = (169.7) \sin \omega t$. Find:
   i) rms o/p voltage
   ii) triggering angle α
   b. iii) rms value of SCR current
   iv) average value of SCR current
   v) input power factor. **(08 Marks)**

Draw the circuit of single phase bidirectional AC voltage controller with inductive load. Explain its operation along with relevant waveforms. Derive the expression for rms output voltage. **(08 Marks)**

Module-4

7 a. A step down chopper is used for supplying power to load consisting of resistance of 5Ω and inductance of 7.5 mH. The chopper is operated at a constant frequency 1 kHz and the duty cycle is adjusted to get maximum ripple current in the load. Calculate:
   i) peak currents I_1 and I_2
   ii) the ripple current ΔI
   iii) average load current
   iv) rms load current
   v) average source current. **(08 Marks)**

   b. Draw the circuit of step up chopper and explain its operation with relevant waveforms. Derive the expression for output voltage and show that the o/p voltage is greater than the input voltage. **(08 Marks)**

OR

8 a. A step down chopper is used for supplying power to 10Ω load. The input voltage is 220 V. The voltage drop across the chopper is 2V. The operating frequency of the chopper is 1 kHz with a duty cycle of 0.5. Calculate: (i) rms and average output voltage (ii) efficiency of the converter (iii) input resistance (iv) rms value of fundamental component of output voltage. **(08 Marks)**

   b. Explain the classification of chopper. **(08 Marks)**

Module-5

9 a. Explain the operation of single phase full bridge inverter with relevant waveforms. **(08 Marks)**

   b. With the help of circuit diagram and relevant waveform, explain current source inverter. What are the advantages and disadvantages of current source inverter? **(08 Marks)**

OR

10 a. Explain the working of boost inverter with the help of neat circuit diagram and waveforms. Derive the expression for o/p voltage. **(08 Marks)**

   b. Write short notes on:
   i) Single phase AC switches
   ii) Solid state switches **(08 Marks)**

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15EC744

Seventh Semester B.E. Degree Examination, June/July 2019
Cryptography

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the greatest common divisor 'd' of the gcd(1160718174, 316258250) using Euclidean algorithm and common divisor method. **(10 Marks)**

b. i) List the properties of congruencies. **(02 Marks)**

ii) List the properties of rings, groups and fields. **(04 Marks)**

OR

2 a. For an GF(5) on the set Z_5 (5 is a prime) with addition and multiplication operators. Find values for addition, multiplication operators. Find values for addition, multiplication, additive inverse and multiplicative inverse. **(06 Marks)**

b. Let $f(x) = x^3 + x^2 + 2$ and $g(x) = x^2 - x + 1$, where S is the set of integers. Find:

i) f(x) + g(x) ii) f(x) – g(x) iii) f(x) × g(x) iv) f(x) ÷ g(x) **(06 Marks)**

c. Find gcd[a(x), b(x)] for $a(x) = x^6 + x^5 + x^4 + x^3 + x^2 + x + 1$ and $b(x) = x^4 + x^2 + x + 1$. **(04 Marks)**

Module-2

3 a. Encrypt the message MATH using Hill Cipher with the key $H = \begin{pmatrix} 3 & 2 \\ 1 & 5 \end{pmatrix}$ working in mod 36 and also decrypt the message use A = 0, etc. **(08 Marks)**

b. With a neat diagram, explain stream Cipher using algorithmic bit-stream generator. **(04 Marks)**

c. List and explain the parameters and design features for Feistal networks. **(04 Marks)**

OR

4 a. Encrypt the message "HELLO" for the given key "NETWORK". **(06 Marks)**

b. Encrypt the plain text "Welcome to my session" using Rail fence Cipher and Row transposition technique key is 32451. **(04 Marks)**

c. With neat block diagram, explain DES encryption algorithm. **(06 Marks)**

Module-3

5 a. Explain AES encryption process with a neat diagram. **(08 Marks)**

b. Calculate X_i and R_i values using linear congruential method use a = 13, c = 0 and m = 64. **(04 Marks)**

c. Write a note on correlation immunity. **(04 Marks)**

OR

6 a. List and explain different stream cipher generators using LFSRs. **(08 Marks)**

b. With neat block diagram, explain AES encryption and decryption. **(08 Marks)**

Module-4

7 a. State and prove the Fermat's theorem and also find prime number of a = 3 and p = 5. **(08 Marks)**

b. With a neat block diagram, explain RSA processing of multiple blocks. **(08 Marks)**

OR

8 a. Encrypt the plain text "How are you?" using RSA algorithm and also calculate the decrypt the message. **(08 Marks)**

b. Explain analog of Diffe-Hellman key exchange process. **(08 Marks)**

Module-5

9 a. List the steps involved in generating prime for DSA as per NIST recommendations. **(08 Marks)**

b. Describe different method to generate a longer hash value than a given hash function produces. **(04 Marks)**

c. Write a note on one-way Hash functions. **(04 Marks)**

OR

10 a. Write a note on N-Hash. **(08 Marks)**

b. Outline the improvements of MD5 over MD4. **(04 Marks)**

c. List the secure Hash functions where the block length equals the Hash size. **(04 Marks)**

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15EC751

Seventh Semester B.E. Degree Examination, June/July 2019
DSP Algorithm and Architecture

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain with the block diagram of a DSP system. Also draw the typical signals in DSP scheme. **(06 Marks)**

b. Mention the difference between FIR and IIR filters. **(04 Marks)**

c. Calculate the dynamic range and precision of each of the following representation formats:
i) 24-bit, single-precision, fixed-point format.
ii) 48-bit, double-precision, fixed-point format.
iii) A floating-point format with a 16-bit Mantissa and 8 bit exponent. **(06 Marks)**

OR

2 a. Explain the decimation and interpolation with equation. Let x(n) = {3, 2, -2, 0, 7}. It is interpolated using an interpolation filter b_k = {0.5, 1, 0.5} with interpolation factor 2. Determine the interpolation sequence. **(08 Marks)**

b. Explain number formats for signals and coefficients in DSP systems. **(08 Marks)**

Module-2

3 a. Give the structure of 4 × 4 Braun multiplier and explain its concept. What modification is required to carryout multiplication of signed no's? **(08 Marks)**

b. With a neat block diagram, explain arithmetic logic unit (ALU) of a DSP system. **(04 Marks)**

c. Compute the sequence in which the input data should be ordered for a 16 point DIT FFT. **(04 Marks)**

OR

4 a. Identify the addressing modes of the operands in each of the following instructions and their operation: i) ADD B ii) ADD # 22h iii) ADD + *addrreg iv) ADD *addrreg, offset + **(08 Marks)**

b. Explain system level parallelism and pipelining. **(08 Marks)**

Module-3

5 a. Compare architectural features of TMS320C25, and ADSP2100 fixed point DSPs. **(06 Marks)**

b. Assuming the cement content of AR3 to be 200h. What will be its contents after each of the following TMS320C54XX addressing modes is used? Assume content of ARO is 20h. **(04 Marks)**

c. Write a program to compute the sum of three product terms given by the equation $y(n) = h_0 x(n) + h_1 x(n-1) + h_2 x(n-2)$. **(06 Marks)**

OR

6 a. Explain functional architecture of TMS320C54XX processor, with a block diagram. **(10 Marks)**

b. Write the status register (STO) and processor mode status register (PMST) format and explain various bits functions. **(06 Marks)**

Module-4

7 a. Determine the value of each of the following 16-bit numbers represented using the given Q-Notation:

i) 4400h as a Q_0 Number

ii) 0.3125 as a Q_{15} Number

iii) CDCAh as a Q_7 Number

iv) 4400h as a Q_{15} Number. **(04 Marks)**

b. Explain the butterfly computation in DIT FFT algorithm and write a subroutine for 8 point DIT FFT algorithm. **(12 Marks)**

OR

8 a. Write a program to multiply two Q_{15} numbers in TMS320C54XX processor. **(04 Marks)**

b. Briefly explain IIR filter. With the help of block diagram, explain second order IIR filters. **(04 Marks)**

c. What is the need for scaling of inputs? Derive the scaling required in FFT calculation. **(08 Marks)**

Module-5

9 a. What are interrupts? How interrupts are handled by the C54XX DSP processors. **(08 Marks)**

b. With a neat block diagram and timing diagram for transmit and receive operation of SSI. Explain the signals involved in synchronous serial interface. **(08 Marks)**

OR

10 a. With neat timing diagram, explain external memory interface signals of TMS320C54XX processor for read-write operation. **(08 Marks)**

b. With a neat block diagram, explain the DSP based biotelemetry receiver system. **(08 Marks)**

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15EC81

Eighth Semester B.E. Degree Examination, June/July 2019
Wireless Cellular and LTE 4G Broadband

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain the advantages of OFDM for LTE. **(08 Marks)**

b. Explain flat LTE SAE architecture. **(08 Marks)**

OR

2 a. Explain the following in brief,
(i) Pathloss and Shadowing.
(ii) Angular Spread and coherence distance.
(iii) Doppler spread and coherence time. **(09 Marks)**

b. Explain with a neat diagram, adaptive modulation and coding. **(07 Marks)**

Module-2

3 a. With a neat block diagram, explain OFDM communication system. Also mention the need of timing and frequency synchronization. **(09 Marks)**

b. Explain SC-FDMA uplink transmitter with a neat figure. **(07 Marks)**

OR

4 a. Explain spatial diversity of multiple antenna techniques. **(08 Marks)**

b. Explain open-loop MIMO in spatial multiplexing. **(08 Marks)**

Module-3

5 a. Explain the LTE Radio Interference protocols. **(08 Marks)**

b. Explain the transport channels in LTE. **(08 Marks)**

OR

6 a. Explain the hierarchical channel structure of LTE. **(08 Marks)**

b. Explain briefly layer mapping and precoding in modulation mapping. **(08 Marks)**

Module-4

7 a. Explain uplink control information. **(08 Marks)**

b. Explain the types of uplink reference signals. **(08 Marks)**

OR

8 a. Briefly explain the function of H-ARQ feedback in Downlink and Uplink transmission. **(08 Marks)**

b. Explain in brief types of Random Access procedure in LTE. **(08 Marks)**

Module-5

9 a. Explain the main services and functions of PDCP sublayer for the user plane. **(08 Marks)**

b. Explain RRC states and its functions. **(08 Marks)**

OR

10 a. Explain mobility management over the S1 transfer. **(08 Marks)**

b. Explain three basic approaches to mitigate ICI in downlink. **(08 Marks)**

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15EC82

Eighth Semester B.E. Degree Examination, June/July 2019
Fiber Optics and Networks

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With the help of neat diagram, explain the man blocks of an optical fiber communication link. **(10 Marks)**

b. Explain the advantages and disadvantages and applications of optical fiber communication system. **(06 Marks)**

OR

2 a. With the neat diagram, discuss the structure of single mode and multimode step index fiber with advantages for each type. **(08 Marks)**

b. A silica glass optical fiber has a core refractive index of 1.480 and the cladding refractive index of 1.460 (n_1 = 1.480, n_2 = 1.460) calculate critical angle, acceptance angle and numerical aperture and the number of guided modes at 1300mm if cone radius is 20μm. **(08 Marks)**

Module-2

3 a. Explain different absorption mechanisms in optical fibers. **(08 Marks)**

b. Explain linear and non–linear scattering losses in optical fibers. **(08 Marks)**

OR

4 a. Explain macro bending and micro bending losses with a neat diagram. **(06 Marks)**

b. Explain briefly about chromatic dispersion within an optical fiber. **(06 Marks)**

c. When the mean optical power launched into an 8 km length of fiber is 120 μw, the mean optical power at the fiber output is 0.3μw.
Determine :
i) The overall signal attenuation or loss in decibels thro' the fiber assuming that there are no connectors and splices.
ii) The signal attenuation per kilometer for the fiber. **(04 Marks)**

Module-3

5 a. Draw the diagram of a typical GaAlAs double Hetrostructure LED along with energy band diagram and refractive index profile and explain. **(10 Marks)**

b. Explain the terms :
i) Spontaneous emission
ii) Stimulated emission
iii) Quantum efficiency. **(06 Marks)**

OR

6 a. Explain Fabry–Perot resonator cavity of laser with a neat diagram. **(06 Marks)**

b. Briefly discuss the possible sources of noise in optical fiber receiver. **(06 Marks)**

c. A GaAs laser operating at 850nm Los 560μm length and refractive index n = 3.7. What are the frequency and over length spacing's? **(04 Marks)**

Module-4

7 a. Explain the operational principle and implementations of WDM with diagram. **(08 Marks)**

b. Explain polarization independent Isolator with a neat diagram. **(08 Marks)**

OR

8 a. Explain optical circulators and optical add/drop multiplexers in detail. **(06 Marks)**

b. Explain the amplification mechanism in EDFA amplifier with the help of energy band diagram. **(10 Marks)**

Module-5

9 a. Explain about synchronous networks with STS frame structure. **(08 Marks)**

b. Describe about internet protocol and in evolution over physical layer evolution and traffic flow pattern with relevant diagram. **(08 Marks)**

OR

10 a. Explain with neat diagrams, Wavelength convertible routing network architecture. **(08 Marks)**

b. Write short note on optical fiber access networks and local are networks. **(08 Marks)**

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15EC835

Eighth Semester B.E. Degree Examination, June/July 2019
Network and Cyber Security

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 operation of SSL Record protocol with a neat sketch. **(08 Marks)**

b. Explain SSH Transport layer protocol packet formation, with a neat sketch. **(08 Marks)**

OR

2 a. Explain the 4 phases of Handshake protocol with a diagram. **(08 Marks)**

b. Describe SSL connection and SSL session in detail. **(08 Marks)**

Module-2

3 a. Explain the PGP operational description for E – main compatibility, with a neat sketch. **(10 Marks)**

b. Define R64 conversion and RFC 5322. **(06 Marks)**

OR

4 a. Illustrate the key components of the Internet mail architecture, with a neat diagram. **(10 Marks)**

b. List and brief the Enhanced Security Services in detail. **(06 Marks)**

Module-3

5 a. Describe the transport and tunnel modes used for IPSec ESP Services bringing out their scope relevant to IPV4 and IPV6, with a neat diagram. **(10 Marks)**

b. Describe the SA parameters and SA selector in details. **(06 Marks)**

OR

6 a. Discuss the different authentication methods used with IKE key determination. **(08 Marks)**

b. What is Security Association? Discuss the parameters used to describe security association. **(08 Marks)**

Module-4

7 a. Explain the following : i) Can't patch Dumb ii) Never Read the Logs. **(10 Marks)**

b. Describe the antipatterns concept, with a diagram. **(06 Marks)**

OR

8 a. Explain Full cyber antipatterns template in detail. **(08 Marks)**

b. List and explain the 3 types of forces in Cyber antipatterns. **(08 Marks)**

Module-5

9 a. What are the model names in the Zachman Framework? Explain. **(08 Marks)**

b. Describe Architectural problem solving patterns in detail. **(08 Marks)**

OR

10 a. What are common tasks that network administrators perform for end user of IT? Explain. **(08 Marks)**

b. How many rows and columns are in the Zachman Framework? Explain in detail. **(08 Marks)**

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