CBCS SCHEME

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15EC71

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. List four applications of Reflex Klystron. **(04 Marks)**

b. Derive transmission line equations in voltage and current forms. **(06 Marks)**

c. A transmission line is terminated in a resistive load of 1000Ω and has L = 9μH/m and C = 100pF/m. Calculate reflection coefficient and standing wave ratio. **(06 Marks)**

OR

2 a. Define reflection coefficient. Derive an expression for reflection coefficient at load in terms of characteristic impedance and load impedance. **(08 Marks)**

b. Explain microwave system with the aid of a diagram. **(08 Marks)**

Module-2

3 a. For a two port network with mismatched load derive an expression for input reflection coefficient. **(06 Marks)**

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

OR

4 a. What is a reciprocal device? Write five point comparison among [S], [Z] and [Y] matrices. **(06 Marks)**

b. Given $[z]=\begin{bmatrix}3 & 7\\ 2 & 5\end{bmatrix}$. Find S–matrix. **(05 Marks)**

c. Explain coaxial line fixed alternator with a diagram. **(05 Marks)**

Module-3

5 a. Derive characteristic impedance of micro-strip lines. **(08 Marks)**

b. Define the following terms with respect to antennas :
i) Beam area
ii) Radiation intensity
iii) Beam efficiency
iv) Directivity. **(08 Marks)**

OR

6 a. Describe ohmic skin losses and radiation losses in micro-strip lines. **(10 Marks)**

b. A parabolic reflector antenna is circular in cross section with a diameter of 1.22m. If the maximum effective aperture is 55% of the physical aperture, calculate gain of the antenna in dB at 20 GHz. **(06 Marks)**

Module-4

7 a. Prove that directivity for a source with unidirectional pattern of $U_m \cos^n\theta$, where 'n' can be any number, can be expressed as $D = 2(n + 1)$. **(06 Marks)**

b. Obtain filed expression of two isotropic point sources of same amplitude and phase. **(10 Marks)**

OR

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

b. Derive an expression for radiation resistance of short electric dipole. **(10 Marks)**

Module-5

9 a. Find directivity and radiation resistance of a loop antenna with diameter of 2λ. **(06 Marks)**

b. Write a short note on Helical antenna geometry. **(06 Marks)**

c. What is the directivity in dB of a rectangular horn antenna, which has physical aperture of $81\lambda^2$, with aperture efficiency 89%? **(04 Marks)**

OR

10 a. Derive radiation resistance of a small single turn circular loop antenna with uniform phase current. **(08 Marks)**

b. Draw the structure of a pyramidal horn antenna. Use the principle of equality of path length and bring out the optimum horn dimensions. **(08 Marks)**

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15EC72

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. With the help of a block diagram, explain the fundamental steps in digital image processing. **(10 Marks)**

b. Explain the concept of sampling and quantization using a single example. **(06 Marks)**

OR

2 a. Explain the importance of brightness adaption and discrimination in image processing. **(06 Marks)**

b. Explain 'false contouring' and check board pattern in image processing. **(06 Marks)**

c. Explain city block distance with an example. **(04 Marks)**

Module-2

3 a. Explain the power law transformation and piece –wise linear contrast stretching with a neat graphical illustration. **(10 Marks)**

b. Explain with a block diagram, the basic steps for image filtering in frequency domain. **(06 Marks)**

OR

4 a. Perform histogram, equalization of the 5 × 5 image.

Gray level	0	1	2	3	4	5	6	7
Number of pixels	0	0	0	6	14	5	0	0

Table Q4(a)

whose data is shown in table Q4(a). **(08 Marks)**

b. Explain the smoothing of images in frequency domain using :
i) ideal low pass filter ii) butter worth low pass filter. **(08 Marks)**

Module-3

5 a. Explain the basic model of image restoration process. Explain any four important noise probability density functions. **(10 Marks)**

b. Explain minimum mean square error (Wiener) filtering in image processing. **(06 Marks)**

OR

6 a. Explain adaptive mean filter and list its advantages. **(08 Marks)**

b. With necessary mathematical equations, explain estimate the degradation function by modeling. **(08 Marks)**

Module-4

7 a. Develop a procedure for converting :
i) RGB to HSI model
ii) HSI to RGB model. **(08 Marks)**

b. Obtain the Harr transform matrix for N = 4. **(08 Marks)**

OR

8 a. Write a note on pseudocolor image processing. Explain intensity slicing as applied to pseudo color image processing. **(08 Marks)**

b. Explain Erosion and Dilation in image processing. **(08 Marks)**

Module-5

9 a. Explain Marr-Wildreth edge detector in image processing. **(08 Marks)**

b. Explain MPP algorithm in image representation (MPP – Minimum Permimeter Polygon). **(08 Marks)**

OR

10 a. Explain basic global thresholding with iterative algorithm. **(08 Marks)**

b. Explain simple descriptors and Fourier descriptors. **(08 Marks)**

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15EC73

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. What is a converter? How are power converters classified? Explain briefly. **(08 Marks)**

b. Give symbol, characteristic features of the following devices:
GTO, TRIAC, MOSFET, UJT **(08 Marks)**

OR

2 a. With necessary waveforms, explain the steady state characteristics of a power transistor. **(08 Marks)**

b. Draw the switching model of MOSFET and explain its switching characteristics with neat figure. **(08 Marks)**

Module-2

3 a. With a neat figure, explain the dynamic turn-on and turn-off characteristics of a thyristor. **(08 Marks)**

b. Derive expression for anode current using two-transistor model in case of SCR. **(08 Marks)**

OR

4 a. What is forced commutation? With the help of circuit diagram and waveform, explain the operation of class-A commutation. **(08 Marks)**

b. With neat circuit diagram and waveforms, explain RC – Half wave firing circuit. **(08 Marks)**

Module-3

5 a. With a circuit diagram and waveform, explain the working of a single-phase full converter with RL load. Derive an expression for the average voltage across the load. **(08 Marks)**

b. What is a dual converter? Explain its operation with a neat circuit diagram. **(08 Marks)**

OR

6 a. What is an AC voltage controller? With the help of waveform, explain ON-OFF AC voltage controller. **(08 Marks)**

b. Explain the operation of single phase bi-directional AC voltage controller for inductive load with the help of circuit diagram and waveforms. **(08 Marks)**

Module-4

7 a. Explain the working principle of step-down chopper and derive expression for :
(i) Average output voltage
(ii) Output power
(iii) Effective input resistance in terms of chopper duty cycle. **(08 Marks)**

b. Explain the operation of a step-up chopper with resistive load. **(08 Marks)**

OR

8 a. With the help of circuit diagram, explain four quadrant type E Chopper. **(08 Marks)**

b. With the help of circuit diagram and waveforms, explain the working of a Buck regulator. Derive the expression for peal-peak-ripple current of the inductor. **(08 Marks)**

Module-5

9 a. Explain the operation of single-phase half bridge inverter with feedback diodes, derive the expression for r.m.s output voltage. **(08 Marks)**

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

OR

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

b. Explain the variable DC link inverter with circuit diagram and waveforms. **(04 Marks)**

c. Write short note on static switches. **(04 Marks)**

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15EC81

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. List the advantages of OFDM leading to its selection for LTE and explain. **(08 Marks)**

b. Discuss the delay spread and coherence bandwidth with relevant expressions. **(08 Marks)**

OR

2 a. Write the block diagram of end to end architecture of EPC supporting current and legacy Radio access networks and discuss the elements of EPC. **(08 Marks)**

b. Consider a user in downlink of a cellular system where the desired base station is at a distance 0.5 KM and the interfering base stations (i) B_1 and B_2 located at a distance of 1.0 KM. (ii) B3, B4 and B5 located at a distance of 2 KM (iii) B6 to B11 treated at a distance of 2.66 KM. Each of the stations transmitted power at the same level. Find the SIR when the path loss exponent $\alpha = 3$ and also when $\alpha = 5$. **(08 Marks)**

Module-2

3 a. With the help of neat diagrams explain how the timing and frequency synchronization is performed by the receiver to demodulate an OFDM signal. **(08 Marks)**

b. Write the block diagrams of receive diversity and explain the principle of operation. **(08 Marks)**

OR

4 a. Write the block diagram of OFDMA down link transmitter and explain the principle of operation. **(08 Marks)**

b. Explain the spatial multiplexing MIMD system and the key points of single user MIMD system model. **(08 Marks)**

Module-3

5 a. Discuss the radio interface protocol stock of LTE. **(08 Marks)**

b. Write the structure of downlink resource grid and explain the types of resource allocation. **(08 Marks)**

OR

6 a. Write the Frame structure Type 2 and explain the various fields applicable to TDD mode. **(08 Marks)**

b. Discuss the Broadcast channels and multicast channels. **(08 Marks)**

Module-4

7 a. With the help of a neat block diagram, explain the SC-FDMA base band signal generation. **(08 Marks)**

b. Discuss the random access procedures in detail. **(08 Marks)**

OR

8 a. Explain the seven different transmission modes, defined for data transmission on the PDSCH channel. **(07 Marks)**

b. Discuss the scheduling and resource allocation in LTE. **(09 Marks)**

Module-5

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

b. Describe the various phases of S1 mobility with a neat diagram. **(08 Marks)**

OR

10 a. Explain the data transfer modes and the main services and functions of the RLC sublayer. **(08 Marks)**

b. Discuss the intercell interference coordination in downlink and uplink. **(08 Marks)**

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CBCS SCHEME

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15EC744

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Cryptography

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. List the properties of modular Arithmetic in Z_n. **(05 Marks)**

b. For $f(x) = x^7 + x^5 + x^4 + x^3 + x + 1$ and $g(x) = x^3 + x + 1$, find
i) $f(x) \cdot g(x)$ ii) $f(x) / g(x)$. **(05 Marks)**

c. State the axioms of groups and rings. **(06 Marks)**

OR

2 a. List the classes of polynomial arithmetic. **(04 Marks)**

b. Find inverse of $x^8 + x^4 + x^3 + x + 1$ in $x^7 + x + 1$ using extended Euclidean. **(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 $b(x) = x^4 + x^2 + x + 1$. **(06 Marks)**

Module-2

3 a. Encrypt the plain text "HARD WORK" using Hill Cipher with key
$\begin{vmatrix} 7 & 8 \\ 19 & 3 \end{vmatrix}$ and decrypt the same. **(10 Marks)**

b. Explain Caesar cipher with an examples. **(06 Marks)**

OR

4 a. Draw the single round DES algorithm and explain the process in detail. **(08 Marks)**

b. Encrypt the plain text "ELECTRONICS" using a play fair cipher with a key. "INDIA", also give rules for encryption. **(08 Marks)**

Module-3

5 a. Write a note on Linear Feedback shift registers. **(06 Marks)**

b. Write a neat diagram of AES encryption and decryption process. **(10 Marks)**

OR

6 a. Briefly describe SubBytes and shift rows in AES algorithm. **(10 Marks)**

b. Write a note on Linear Congruential generates. **(06 Marks)**

Module-4

7 a. Write RSA algorithm. Perform an encryption and decryption using RSA algorithm for p = 3, q = 11 , e = 7 and m = 5. Find the cipher text 'c' and decrypt 'c' to get plain text M. **(10 Marks)**

b. State Fermat's little theorem. Find the result of 3^{90} mod 91. Use Fermat little theorem. **(06 Marks)**

OR

8 a. In Diffie Hullman key exchange q = 71 , its primitive root $\alpha = 7$. A's private key is 5 , B's private key is 12. Find i) A's public key ii) B's public key iii) Shared secret key. **(08 Marks)**

b. Write a note on Elliptic curve Arithmetic on the Elliptic curve E23 (1, 1) , P = (3, 10) and Q = (9, 7). Find i) P + Q ii) 2P. **(08 Marks)**

Module-5

9 a. What is one way hash function? Explain birthday attack. **(08 Marks)**

b. List the design goals of MD4. **(04 Marks)**

c. List four criticisms against DSA. **(04 Marks)**

OR

10 a. Explain Digital Signature Algorithm. **(10 Marks)**

b. Write a note on Secure Hash Algorithm. **(06 Marks)**

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15EC751

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. With a neat block diagram, explain DSP systems. Mention the design issues in implementing DSP system. **(08 Marks)**

b. Explain interpolation process with relevant equations. Find the interpolated sequence if the input x(n) = [0, 3, 6, 9, 12] is inter-plated using I = 3. The coefficient of low-pass filter b_k = [1/3, 2/3, 1, 2/3, 1/3]. **(08 Marks)**

OR

2 a. Discuss in detail, the typical formats used for numbers to represent signals and coefficients in DSP systems. **(10 Marks)**

b. Calculate the dynamic range and precision 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. Design a 4 × 4 Braun multiplier. Explain in detail with relevant equations comment on bus width. **(10 Marks)**

b. Explain the following addressing modes :
i) Circular addressing mode
ii) Indirect addressing mode. **(06 Marks)**

OR

4 a. Explain MAC unit with a neat block diagram. Discuss in detail, the methods to avoid overflow/underflow condition. **(10 Marks)**

b. Explain the function of address generation unit. **(06 Marks)**

Module-3

5 a. Compare the architectural features of three fixed-point DSPs : TMS320C25, DSP56000, ADSP2100. **(04 Marks)**

b. Explain the functional diagram of barrel shifter of TMS320C54XX processor. **(06 Marks)**

c. Explain direct addressing mode for TMS320C54XX processor. **(06 Marks)**

OR

6 a. Describe the operation of the following instructions :
   i) MPY *AR2–, * AR4 +0, B
   ii) MAS *AR3–, * AR4 +,B,A
   iii) RPT #2. **(06 Marks)**

b. Write a program to compute the sum of three products terms given by the equation $y(n) = h_0 x(n) + h_1 x(n-1) + h_2 x(n-2)$ where x(n), x(n – 1) and x(n – 2) are data samples stored at three successive data-memory locations and h_0, h_1 and h_2 are constants stored at 3 other successive locations in data-memory. The result y(n) is stored in the data-memory use indirect addressing mode to access data and use MAC instruction. **(06 Marks)**

c. Show the six-stage pipeline of TMS320C54XX execution. Explain each stage in detail. **(04 Marks)**

Module-4

7 a. Explain the concept of Q-notation and highlight on multiplication of number represented using Q–notation. **(06 Marks)**

b. Write a TMS320C54XX program that illustrates the implementation of an interpolating FIR filter of length 15 and interpolating factor 5. **(10 Marks)**

OR

8 a. Write TMS320C54XX program for the following subroutines of 8-point FFT implantations.
   i) Butterfly subroutine
   ii) Bit reverse subroutine. **(10 Marks)**

b. Derive the expression for optimal scaling factor for DIT-FFT butterfly algorithm. **(06 Marks)**

Module-5

9 a. Explain in brief how interrupt handling is done in TMS320C54XX device with a flow chart. **(10 Marks)**

b. Design a circuit to interface an 8KX16 program ROM to TMS320C5416 DSP in the address range 7FE000h – 7FFFFFh. **(06 Marks)**

OR

10 a. Explain with a block dg clipping auto correlation speech detector. **(08 Marks)**

b. Explain JPEG algorithms with relevant block diagram for image processing. **(08 Marks)**

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CBCS SCHEME

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Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. List the advantages of OFDM leading to its selection for LTE and explain. **(08 Marks)**

b. Discuss the delay spread and coherence bandwidth with relevant expressions. **(08 Marks)**

OR

2 a. Write the block diagram of end to end architecture of EPC supporting current and legacy Radio access networks and discuss the elements of EPC. **(08 Marks)**

b. Consider a user in downlink of a cellular system where the desired base station is at a distance 0.5 KM and the interfering base stations (i) B_1 and B_2 located at a distance of 1.0 KM, (ii) B3, B4 and B5 located at a distance of 2 KM (iii) B6 to B11 treated at a distance of 2.66 KM. Each of the stations transmitted power at the same level. Find the SIR when the path loss exponent $\alpha = 3$ and also when $\alpha = 5$. **(08 Marks)**

Module-2

3 a. With the help of neat diagrams explain how the timing and frequency synchronization is performed by the receiver to demodulate an OFDM signal. **(08 Marks)**

b. Write the block diagrams of receive diversity and explain the principle of operation. **(08 Marks)**

OR

4 a. Write the block diagram of OFDMA down link transmitter and explain the principle of operation. **(08 Marks)**

b. Explain the spatial multiplexing MIMD system and the key points of single user MIMD system model. **(08 Marks)**

Module-3

5 a. Discuss the radio interface protocol stock of LTE. **(08 Marks)**

b. Write the structure of downlink resource grid and explain the types of resource allocation. **(08 Marks)**

OR

6 a. Write the Frame structure Type 2 and explain the various fields applicable to TDD mode. **(08 Marks)**

b. Discuss the Broadcast channels and multicast channels. **(08 Marks)**

Module-4

7 a. With the help of a neat block diagram, explain the SC-FDMA base band signal generation. **(08 Marks)**

b. Discuss the random access procedures in detail. **(08 Marks)**

OR

8 a. Explain the seven different transmission modes, defined for data transmission on the PDSCH channel. **(07 Marks)**

b. Discuss the scheduling and resource allocation in LTE. **(09 Marks)**

Module-5

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

b. Describe the various phases of S1 mobility with a neat diagram. **(08 Marks)**

OR

10 a. Explain the data transfer modes and the main services and functions of the RLC sublayer. **(08 Marks)**

b. Discuss the intercell interference coordination in downlink and uplink. **(08 Marks)**

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CBCS SCHEME

USN | | | | | | | | | | |

15EC71

Seventh Semester B.E. Degree Examination, Aug./Sept. 2020
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. Explain the operation of Reflex Klystron with the help of neat sketch. **(06 Marks)**

b. A two-cavity Klystron operates at 5 GHz with a DC beam voltage of 10KV and 2mm cavity gap. For a given input RF voltage, the magnitude of the gap voltage is 100V. Calculate the transit time at the cavity gap, the transit angle, and velocity of the electrons leaving the gap. **(06 Marks)**

c. Define standing wave and standing wave ratio. **(04 Marks)**

OR

2 a. Derive transmission line equations. **(06 Marks)**

b. A certain transmission line has a characteristic impedance of $75 + j0.01\Omega$ and is terminated in load impedance of $70 + j50\Omega$. Compute : i) reflection coefficient ii) transmission coefficient. **(06 Marks)**

c. Mention characteristics of Smith chart with the help of necessary equations. **(04 Marks)**

Module-2

3 a. Write short notes on :
i) Attenuator
ii) Phase shifters. **(08 Marks)**

b. Explain the properties of S-parameters for junction of ports having common characteristic impedance. **(08 Marks)**

OR

4 a. A 20 MW signal is fed into one of the collinear part 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)**

b. Write the characteristics of Magic Tee. Also obtain scattering matrix for Magic Tee. **(08 Marks)**

c. Write short notes on : Coaxial connectors and adapters. **(04 Marks)**

Module-3

5 a. A microstrip line is composed of zero thickness copper conductors on a substrate having $\epsilon_r = 8.4$ $\tan\delta = 0.0005$ and thickness 2.4mm. If the line width is 1mm and operated at 10 GHz, calculate :
i) The characteristic impedance ii) the attenuation due to conductor loss and dielectric loss. **(08 Marks)**

b. Define the following :
i) Beam area
ii) Radiation resistance
iii) Beam efficiency
iv) Radiation intensity. **(08 Marks)**

OR

6 a. Obtain effective aperture and directivity of a half wave dipole. **(05 Marks)**

b. Derive Friis transmission formula. **(05 Marks)**

c. Obtain relationship between directivity and effective aperture. **(06 Marks)**

Module-4

7 a. Define power theorem. **(04 Marks)**

b. Find the directivity 'D' for the following sources with radiation intensity.
i) $U = U_m \sin^2\theta$, $0 \le \theta \le \pi$, $0 \le \phi \le 2\pi$ ii) $U = U_m \cos^2\theta$, $0 \le \theta \le \pi/2$, $0 \le \phi \le \pi/2$. **(05 Marks)**

c. Plot the field pattern for an array of two isotropic point sources with equal amplitude and same phase. Take $d = \lambda/2$. **(07 Marks)**

OR

8 a. Obtain the field pattern for a linear uniform array of isotropic antennas, satisfy the following $n = 5$, $d = \lambda/2$, $\delta = -d_r$. **(06 Marks)**

b. Derive an expression for radiation resistance of a short electric dipole. **(06 Marks)**

c. Explain principle of pattern multiplication with the help of suitable example. **(04 Marks)**

Module-5

9 a. Compare far fields of small loop and short electric dipole. **(04 Marks)**

b. Obtain an expression for radiation resistance of a loop antenna. **(06 Marks)**

c. Develop an expression for the field intensity ratio in the aperture plane for a parabolic reflector. **(06 Marks)**

OR

10 a. Determine the length L, H-plane aperture and flare angles θ_E and θ_H of a pyramidal horn for which the Eplane aperture $a_E = 10\lambda$. The horn is fed by a rectangular waveguide with TE_{10} mode. Let $\delta = 0.2\lambda$ in the Eplane and 0.375λ in the H plane. Also find the directivity. **(06 Marks)**

b. Define helix geometry. Explain practical design considerations for the monofilar axial mode helical antenna. **(06 Marks)**

c. Explain Yagi – Uda array with the help of diagram. **(04 Marks)**

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15EC73

Seventh Semester B.E. Degree Examination, Aug./Sept.2020
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. Give symbol , characteristic features of the following devices :
i) GTO ii) TRIAC iii) MOSFET. **(06 Marks)**

b. Explain different types of power electronic circuits with their input and output waveforms. **(06 Marks)**

c. Explain peripheral effects of power converter system. **(04 Marks)**

OR

2 a. Compare power MOSFET and bipolar junction transistor. **(04 Marks)**

b. Draw the switching model of MOSFET and explain its switching characteristics with neat figure. **(06 Marks)**

c. Explain output and transfer characteristics of IGBT. **(06 Marks)**

Module-2

3 a Explain the static anode – cathode characteristics of SCR. **(06 Marks)**

b. Explain the two transistor model of SCR and derive an expression for anode current in terms of current amplification factor and leakage current. **(06 Marks)**

c. The latching current of a thyristor circuit in fig.Q3(c) is 50mA. The duration of the firing pulse is 50μs. Will the thyristor get fired? **(04 Marks)**

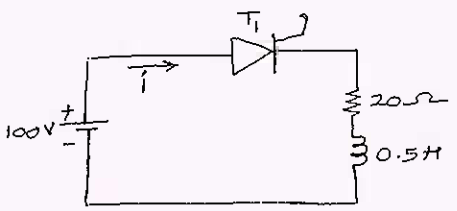

Fig. Q3(c)

OR

4 a. Distinguish between natural and forced commutation with examples. **(04 Marks)**

b. With a neat sketch, explain turn – off mechanism of SCR. **(06 Marks)**

c. With the help of neat circuit diagram and waveforms, explain the UJT firing circuit. **(06 Marks)**

Module-3

5 a. With a circuit diagram and waveforms, explain the working of a single phase full converter with a highly inductive load. Derive an expression for the average output voltage and rms output voltage. **(08 Marks)**

b. With a neat diagram and waveforms, explain the principle of single phase dual converter. **(06 Marks)**

c. Explain the role played by the free – wheeling diode in converters with R – L load. **(02 Marks)**

OR

6 a. Explain the principle of ON – OFF control, with the help of waveforms and derive an expression for rms output voltage. **(06 Marks)**

b. An AC voltage controller has a resistive load of R = 10 and the rms input voltage is 120V, 60Hz. The thyristor switch is ON for n = 25 cycles and is OFF for m = 75 cycles. Determine i) rms output voltage ii) the input power factor iii) the average and rms current of thyristor. **(04 Marks)**

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

Module-4

7 a. Explain the operation of step – down converter with RL load. Also derive an expression for peak – to – peak load ripple current. **(08 Marks)**

b. Explain with suitable circuit and waveforms, the principle of operation of step – up converter. Derive an expression for average output voltage of step-up converter. **(08 Marks)**

OR

8 a. Briefly explain the classification of the converter depending upon the directions of the current and voltage flows. **(05 Marks)**

b. With the help of circuit diagram and waveforms, explain the working of a Buck regulator. Derive the expression for peak – to – peak ripple current of the inductor. **(11 Marks)**

Module-5

9 a. Explain the operation of single phase half bridge inverter with R - load. Derive the expression for rms output voltage. **(08 Marks)**

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

OR

10 a. Explain the working of variable dc – link inverter. **(08 Marks)**

b. With a circuit diagram and waveforms, explain the working of a single phase full wave switch. Also derive an expression for average current and rms current of each thyristor. **(08 Marks)**

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15EC751

Seventh Semester B.E. Degree Examination, Aug./Sept. 2020
DSP Algorithms & Architecture

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. List the major features of programmable Digital Signal Processors. **(04 Marks)**

b. For the IIR filter, $y(n) = 0.9y(n-1) + 0.1x(n)$, determine the system function, poles and zeros and also draw the block diagram. **(06 Marks)**

c. With a neat block diagram, explain Digital Signal Processing System. **(06 Marks)**

OR

2 a. Describe Decimation an Interpolation process with relevant diagrams and equations. **(06 Marks)**

b. Define dynamic range and precision. Calculate the dynamic range and precision of,
(i) 48 bit double precision fixed point format.
(ii) A floating point format with a 16-bit Mantissa and an 8 bit exponent. **(06 Marks)**

c. Find the decimal equivalent of the floating point binary number 1011000011100. Assume a format similar to IEEE754 in which the MSB is the sign bit followed by 4 exponent bits followed by 8 bits for fractional part. **(04 Marks)**

Module-2

3 a. Mention the basic 6 architectural features that should be provided in programmable DSP architecture to implement N^{th} order FIR filter:

$$y(n) = \sum_{i=0}^{N-1} h(i)x(n-i) \; ; n = 0, 1, 2 \ldots.$$ **(06 Marks)**

b. Design 3×3 Braun multiplier for two unsigned numbers. **(06 Marks)**

c. Consider a MAC unit whose inputs are 16 bit numbers. If 256 products are to be computed and summed up in this MAC using pipe lined architecture. MAC with an execution time of the unit is 100 nS. Find
(i) the total time required to complete the operation.
(ii) the number of guard bits needed to prevent overflow. **(04 Marks)**

OR

4 a. Identify the addressing modes of the operands in each of the following instruction :
(i) ADD # 5678h (ii) ADD 5678h (iii) ADD *AR+
(iv) ADD offsetaddr -, *AR **(04 Marks)**

b. A DSP has a circular buffer with the start and the end addresses as 0200h and 020Fh respectively. What would be the new values of the address pointer of the buffer if in the course of address computation, it gets updated to
(i) 0212h (ii) 01FCh **(03 Marks)**

c. With relevant block diagram, explain the features of Address Generation unit. **(09 Marks)**

Module-3

5 a. Explain functional diagram of the barrel shifter of the TMS320C54XX processor. **(08 Marks)**

b. Describe the operation of the following instructions:

(i) MPY *AR2 - , *AR4+0, B

(ii) MAC *AR3 -, *AR4+, B, A

(iii) RPT #2

MAC *AR1+, *AR2-, A **(08 Marks)**

OR

6 a. Develop a TMS320C54XX program to find the sum of series of a signed numbers stored at successive locations in the data memory and place the result in the Accumulator A, i.e.

$$A = \sum_{i=410h}^{411h} dmad(i)$$ **(06 Marks)**

b. Describe the Timer on chip peripheral of TMS320C54XX processor with a logical block diagram. **(04 Marks)**

c. Explain the pipeline operation of TMS320C54XX processor. **(06 Marks)**

Module-4

7 a. Define Q-notation. What values are represented by the 16 bit fixed point number N = 5736h in Q_0, Q_6 and Q_{10} notations. **(04 Marks)**

b. Develop a TMS 320C54XX program for the implementation of a FIR filter. **(07 Marks)**

c. Discuss the digital decimation filter implementation for a decimation factor of '3' and a low pass filter of length '5'. **(05 Marks)**

OR

8 a. Determine the minimum size FFT must be used to compute a DFT of 110 points? What must be done to the samples before the chosen FFT is applied? Also find the number of stages, number of butterflies in each stage and number of butterflies needed for entire computation of such chosen FFT. **(05 Marks)**

b. Derive the optimum scaling factor used to prevent overflow in DIT FFT algorithm. **(07 Marks)**

c. Develop an assembly level language program of TMS320C54XX for Bit Reverse Address Generation subroutine. **(04 Marks)**

Module-5

9 a. Design a data memory system with address range 000800h-000FFFh for a C5416 processor. Use 2K × 8 SRAM memory chips. **(08 Marks)**

b. What are Interrupts? Explain how interrupts are handled by C54XX DSP processors with a flow chart. **(08 Marks)**

OR

10 a. Describe the building blocks of the PCM 3002 CODEC with a neat diagram. **(08 Marks)**

b. Explain the image compression and reconstruction using JPEG Encoder and Decoder. **(08 Marks)**

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CBCS SCHEME

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15EC744

Seventh Semester B.E. Degree Examination, Aug./Sept.2020
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 (1970, 1066) using Euclidean Algorithm and Explain the Algorithm. **(07 Marks)**

b. Explain Extended Euclid algorithm for (m, b). **(05 Marks)**

c. Define Rings and its axioms. **(04 Marks)**

OR

2 a. Define groups and fields. Explain its axioms. **(06 Marks)**

b. Explain polynomial Arithmetic, with an examples. **(05 Marks)**

c. List out the properties of modular Arithmetic for integers in Z_n. **(05 Marks)**

Module-2

3 a. With an example explain play fair cipher. **(09 Marks)**

b. Explain transposition techniques. **(04 Marks)**

c. What is Causal cipher? Give an example. **(03 Marks)**

OR

4 a. Encrypt a message "Paymole money" using a Hill cipher with the key

$$K = \begin{pmatrix} 17 & 17 & 5 \\ 21 & 18 & 21 \\ 2 & 2 & 19 \end{pmatrix}$$ **(08 Marks)**

b. With the help of block diagram explain single round of DES algorithm. **(08 Marks)**

Module-3

5 a. With the help of block diagram explain AES Encryption and decryption. **(10 Marks)**

b. With a example explain 4-bit linear feedback shift registers. **(06 Marks)**

OR

6 a. Elaborate geffe generator, generalized geffe generator and stop-and-go generator of stream ciphers using LFSRs. **(08 Marks)**

b. With the help block diagram Beth-piper stop-and-go generator, alternating stop-and-go generator and Bilateral stop-and-go generator. **(08 Marks)**

Module-4

7 a. State and prove Felmat's theorem. **(05 Marks)**

b. Briefly explain RSA algorithm and key generation. **(07 Marks)**

c. Differentiate between conventional and public-key Encryption. **(04 Marks)**

OR

8 a. State and prove Euler's theorem. **(05 Marks)**

b. Discuss Diffie Hellman key exchange algorithm. Explain how the algorithm is used to exchange secret key. **(06 Marks)**

c. In RSA system it is given P = 17, q = 11, e = 7, M = 88. Find the cipher text C and message M from decryption. **(05 Marks)**

Module-5

9 a. Explain the requirements for message authentication codes. **(08 Marks)**

b. With the help of neat diagram, explain the message digital generation using SHA-512. **(08 Marks)**

OR

10 a. Explain direct digital signature and arbitrated digital signature. **(08 Marks)**

b. Explain MD5 main loop. **(08 Marks)**

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CBCS SCHEME

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15EC82

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Fiber Optics and Networks

Time: 3 hrs. Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain Optical Fiber transmission link with suitable block diagram. **(06 Marks)**
b. Discuss classification of Optical Fiber depending on Refractive Index profile, mode of operation and material used. **(06 Marks)**
c. Find Numerical aperture and number of propagation modes for a step index fiber with indices 1.5 and 1.48 with core radius 25 μm. If the wavelength of the optical signal propagating in the fiber is 1300 nm. **(04 Marks)**

2 a. What are the different types of materials used for fabrication of optical fiber and their requirements? **(06 Marks)**
b. Explain Index-guiding photonic crystal fiber with suitable diagram. **(04 Marks)**
c. Discuss Ray Theory model for multimode step index and graded index fiber. **(06 Marks)**

Module-2

3 a. Explain the different mechanism caused by absorption loss. **(05 Marks)**
b. The Input power to an optical fiber is 2 mw while the power measured at the output end is 2 μw. If the fiber alternation is 0.5 db/km, calculate the length of the fiber. **(05 Marks)**
c. What are the different types of bending losses in fiber and explain with suitable diagram. **(06 Marks)**

4 a. Explain the different types of mechanical misalignment between two fibers. **(05 Marks)**
b. What are the different types of splicing and explain V-groove optical fiber splicing technique. **(05 Marks)**
c. What are the principles of good connector design. **(06 Marks)**

Module-3

5 a. Explain Electron recombination and the associated photon emission for Direct and Indirect bandgap materials. **(06 Marks)**
b. With schematic explain high-radiance surface emitting LED. **(06 Marks)**
c. A double-heterojunction InGaASp LED emitting at a peak wavelength of 1310 nm has radiative and non-radiative recombination time of 30 ns and 100 ns respectively. The drive current is 40 mA calculate internal efficiency and optical power generated internally to the LED. Assume $h = 6.6256\times10^{-34}$ J-s ; $Q = 1.602\times10^{-9}$ C. **(04 Marks)**

OR

6 a. Explain the three key transition process involved in laser action. **(04 Marks)**
b. Explain Reach-Through avalanche photodiode with neat diagram. **(06 Marks)**
c. With schematic explain reverse biased pin photodiode. **(06 Marks)**

Module-4

7 a. Explain the implementation of WDM networks with various types of optical amplifiers. **(06 Marks)**

b. With layout explain 2×2 Mach-Zehnder Interferometer. **(04 Marks)**

c. Explain Design and operation of a Polarization-Independent Isolator. **(06 Marks)**

8 a. Explain MEMS actuation method with neat diagram. **(04 Marks)**

b. Explain 4×4 OADM with miniature switching mirrors. **(06 Marks)**

c. Explain the Basic operation of a generic optical amplifier. **(06 Marks)**

Module-5

9 a. Explain IPV6 packet with extension header. **(06 Marks)**

b. Explain ATM Protocol Architecture. **(04 Marks)**

c. Explain the Basic operation of long-haul circuit switching Telecommunication Networks. **(06 Marks)**

10 a. Explain Optical-cross connect architecture using optical space switches. **(08 Marks)**

b. Explain Generic Structure of an optical burst switching networks. **(08 Marks)**

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CBCS SCHEME

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15EC81

Eighth Semester B.E. Degree Examination, Aug./Sept. 2020
Wireless Cellular and LTE 4G Broadband

Time: 3 hrs. Max. Marks: 80

Note: *: i) For Regular Students: Answer any FIVE full questions irrespective of modules.*
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Discuss the key enabling technologies used in LTE design. **(08 Marks)**
b. Explain with a neat diagram, how 3 GPP network evolved towards flat LTE – SAE architecture. **(04 Marks)**
c. Give a brief description of evolved packet core architecture. **(04 Marks)**

2 a. Explain the cellular concept briefly. Discuss how interference can be reduced in cellular communication. **(08 Marks)**
b. What are the techniques used for mitigating broad band fading? Explain. **(08 Marks)**

Module-2

3 a. Briefly explain the different multiple access system which can be implemented with OFDM. **(08 Marks)**
b. Discuss the significance of PAR problem in LTE. Briefly explain PAR reduction technique. **(08 Marks)**

4 a. With a neat diagram, explain SC–FDMA. List out the advantages and disadvantages SC–FDM. **(08 Marks)**
b. Explain open loop MIMO with a neat sketch. **(08 Marks)**

Module-3

5 a. Discuss the basic design principles followed in designing LTE specifications. **(06 Marks)**
b. Explain the different logical channels supported in LTE. **(06 Marks)**
c. With a neat diagram, explain briefly the frame structures used in LTE. **(04 Marks)**

6 a. Briefly explain downlink transport channel processing. **(08 Marks)**
b. Explain the different physical signals in down link. **(08 Marks)**

Module-4

7 a. Discuss the uplink Control Information (uCI) which will assist physical layer procedures. **(08 Marks)**
b. Briefly explain Random Access Preamble formats. **(08 Marks)**

8 a. Explain Channel Quality Indicator (CQI) feedback by describing CQI estimation and different reporting modes. **(08 Marks)**

b. Discuss the power control schemes used in LTE. **(08 Marks)**

Module-5

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

b. What are the different modes of operations of RLC entity? **(04 Marks)**

c. Briefly explain ARQ procedures in LTE. **(04 Marks)**

10 a. With a neat flow diagram explain mobility management over S1 interface. **(08 Marks)**

b. Discuss intra – LTE and inter – RAT mobility briefly. **(03 Marks)**

c. Explain the approaches to mitigate Inter Cell Interference (ICI) in the down link. **(05 Marks)**

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