CBCS SCHEME

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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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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
iii) rms value of SCR current
iv) average value of SCR current
v) input power factor. **(08 Marks)**

b. 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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15EC743

Seventh Semester B.E. Degree Examination, June/July 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 RTS and explain generalized computer control system with neat block diagram. **(08 Marks)**

b. With an example, explain sequence control in field application. **(08 Marks)**

OR

2 a. Explain hard and soft RTS with relevant equations and example. **(08 Marks)**

b. Explain about DDC (Direct Digital Control) and its advantages with diagram. **(08 Marks)**

Module-2

3 a. Explain digital signal interface with neat diagram. **(08 Marks)**

b. Explain daisy chain interrupt structure with neat diagram. **(08 Marks)**

OR

4 a. Explain parallel computer architectures with neat block diagram. **(08 Marks)**

b. Explain different LAN topologies with neat diagram. **(08 Marks)**

Module-3

5 a. Explain the following terms : i) security ii) readability iii) portability. **(09 Marks)**

b. Explain various data types in brief. **(07 Marks)**

OR

6 a. Explain scope and visibility of a variable. **(07 Marks)**

b. Explain : i) exception handling ii) co-routines iii) global and local variables. **(09 Marks)**

Module-4

7 a. List the functions of task management. Explain with a neat diagram task state diagram and task states. **(08 Marks)**

b. Explain : i) serially reusable code ii) reentrant code. **(08 Marks)**

OR

8 a. Explain mutual exclusion using binary semaphore. **(08 Marks)**

b. Explain with a suitable diagram the multi user and multi tasking operating system. **(08 Marks)**

Module-5

9 a. Explain foreground and background system with flow chart. **(10 Marks)**

b. Explain Yourdon methodology. **(06 Marks)**

OR

10 a. Explain software design of RTS using software modules. **(08 Marks)**

b. With a relevant diagram explain ward and Mellor's method. **(08 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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