CBCS SCHEME

17EC71

USN

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Microwave and Antennas

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With neat diagram, explain construction and operation of reflex Klystron. **(10 Marks)**

b. Define and derive an expression for reflection coefficient when the transmission line is terminated by load impedence (Z_L). **(06 Marks)**

c. A transmission line working at RF has following constants, L = 9 μH/m, C = 16 PF/m the line is terminated in a resistive load of 1000 Ω. Find the reflection coefficient and standing wave ratio. **(04 Marks)**

OR

2 a. Explain the different mode current of reflex klystron. **(06 Marks)**

b. Show the relationship between standing wave ratio and reflection coefficient. **(06 Marks)**

c. A transmission line has the following primary constants per km of the line, R = 8 Ω, G = 0.1 m℧, L = 3.5 mH and C = 9 nF. Calculate Z_0, α, β, VP and λ at W = 5000 rad/sec. **(08 Marks)**

Module-2

3 a. Define the following losses in microwave interms of s-parameters. (i) Transmission loss (ii) Reflection loss (iii) Return loss (iv) Insertion loss **(06 Marks)**

b. Explain S-matrix representation for multi port network. **(06 Marks)**

c. State the properties of S-parameters, prove the symmetry property and unitary property of S-parameter. **(08 Marks)**

OR

4 a. With a neat diagram, explain rotary precision phase shifter. **(06 Marks)**

b. What is magic tee? Explain magic tee and derive an S-matrix. Mention its application. **(08 Marks)**

c. Explain different types of co-axial connectors in microwave circuits. **(06 Marks)**

Module-3

5 a. What are the losses in microstrip lines? Explain the radiation losses. **(08 Marks)**

b. Show that the maximum effective aperture of a short dipole is $0.119\lambda^2$. **(06 Marks)**

c. Obtain the expression for inductance, capacitance and hence characteristic impedance of a parallel strip line. **(06 Marks)**

OR

6 a. Derive characteristic impedance of microstrip line with diagram. **(06 Marks)**

b. Using power theorem find the directivity for the source with unidirectional cosine square power pattern. $U(\theta,\phi) = U_m \cos^2\theta$. **(06 Marks)**

c. Explain the following parameters with respect to antenna:
(i) Directivity (ii) Beam area (iii) Radiation intensity (iv) Beam efficiency **(08 Marks)**

Module-4

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

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

c. A source has a radiation intensity pattern given by $U = U_m \sin\theta$ for $0 \le \theta \ge \frac{\pi}{2}$ and $0 \le \phi \le 2\pi$, find the power and directivity. **(06 Marks)**

OR

8 a. Derive an expression and draw the field pattern of two isotropic point sources of same amplitude and phase. **(08 Marks)**

b. Obtain the expression for field of dipole in general for the case of thin linear antenna. **(06 Marks)**

c. For a short dipole $\frac{\lambda}{15}$ long find the efficiency, radiation resistance if loss resistance is 1 Ω and also find the (i) Maximum effective aperture (ii) Efficiency (iii) Radiation resistance. **(06 Marks)**

Module-5

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

b. Determine the directivity of loop antenna having radius 1.0 m when it is operated at 0.9 MHz. **(04 Marks)**

c. Discuss the following:

(i) Yagi Uda antenna.

(ii) Log periodic antenna. **(08 Marks)**

OR

10 a. Explain Helical geometry with diagram and practical consideration for the manofillar axial mode helical antenna. **(08 Marks)**

b. Derive the expression of far field equation of small loop antenna, with diagram. **(08 Marks)**

c. Find the radiation resistance of a loop antenna with diameter 0.5 m operating frequency at 1 MHz. **(04 Marks)**

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17EC72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Digital Image Processing

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain with block diagram, the fundamental steps used in digital image processing. **(10 Marks)**

b. Explain with relevant diagrams, different sensor arrangements. **(10 Marks)**

OR

2 a. Explain the process of sampling and quantization, with relevant diagrams. **(10 Marks)**

b. Define following: (i) Spatial and Intensity Resolution (ii) 4-, 8- and m-adjacency (iii) Euclidean distance, city-block distance and chessboard distance **(10 Marks)**

Module-2

3 a. Explain with plots, some basic intensity transformation functions. **(10 Marks)**

b. With relevant equations, discuss the discrete Laplacian of two variables and different implementation of Laplacian operator masks. **(10 Marks)**

OR

4 a. Discuss with relevant diagrams, the image smoothing using the frequency domain low pass filters (i) Ideal (ii) Butterworth (iii) Gaussian **(10 Marks)**

b. Explain the following selective filter: (i) Bandreject and Bandpass Filters (ii) Notch Filters **(10 Marks)**

Module-3

5 a. Discuss various noise models with respect to image restoration process. **(10 Marks)**

b. Explain the following methods for estimating degradation function: (i) Estimation by image observation (ii) Estimation by experimentation **(10 Marks)**

OR

6 a. Explain the process of restoration of images using Inverse Filtering technique. **(10 Marks)**

b. Explain with relevant equations, Minimum Mean Square Error (Wiener) Filtering. **(10 Marks)**

Module-4

7 a. Explain the following color models: (i) RGB (ii) HSI **(10 Marks)**

b. Explain Pseudocolor Image Processing. **(10 Marks)**

OR

8 a. Explain the following Morphological operations: (i) Erosion (ii) Dilation (iii) Opening (iv) closing **(10 Marks)**

b. Explain multi-resolution expansions used in image processing. **(10 Marks)**

Module-5

9 a. Explain Thresholding based segmentation. Discuss: (i) Global Thresholding (ii) Adaptive Thresholding **(10 Marks)**

b. Explain segmentation of images using Morphological Watersheds. **(10 Marks)**

OR

10 a. Explain Chain Codes used to represent a boundary. **(10 Marks)**

b. Discuss various approaches of boundary description. **(10 Marks)**

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17EC73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw the symbols and the V-I characteristics of the following power semiconductor devices: (i) Diode (ii) Thyristor (SCR) (iii) SITH (iv) GTO (v) TRIAC **(10 Marks)**

b. Explain peripheral effects of power electronic components and equipment, mention how to eliminate them. **(06 Marks)**

c. List out different applications of power electronic system. **(04 Marks)**

OR

2 a. Explain the important characteristic features of power transistors and discuss different operating ranges of power BJT with the aid of output and transfer characteristic. **(10 Marks)**

b. Illustrate the switching characteristics of power MOSFET with necessary waveforms. **(10 Marks)**

Module-2

3 a. Describe modes of operation of SCR with a neat V-I characteristic. **(10 Marks)**

b. Develop two transistor model and derive an expression for anode current in terms of transistor parameters for a thyristor. **(10 Marks)**

OR

4 a. Illustrate with neat diagrams and waveforms, the operation of UJT triggering circuit for SCR. **(10 Marks)**

b. Estimate the required parameter for Snubber circuit to provide $\frac{dv}{dt}$ protection to SCR used in single phase bridge converter; the SCR has a maximum $\frac{dv}{dt}$ of 60 V/Msec. the input line to line voltage has peak value of 425 V and series inductance of 0.2 mH. **(05 Marks)**

c. Compare natural commutation and forced commutation. **(05 Marks)**

Module-3

5 a. Describe with neat diagram and waveforms, half wave controlled rectifier with freewheeling diode and obtain average value of output voltage. **(12 Marks)**

b. A single phase full converter is operated from 120 V, 60 Hz supply. The load current with an average value of I_a is continuous with negligible ripple current. If turn ON ratio of transformer is unity with delay angle $\alpha = \frac{\pi}{3}$. Calculate:

(i) Harmonic Factor (HF) of input current
(ii) Displacement Factor (DF)
(iii) Supply Power Factor (PF) **(08 Marks)**

OR

6 a. Illustrate with neat circuit diagram and waveforms, the working principle of single phase AC voltage controller using phase control. Obtain average value of output voltage for single phase half wave controller. **(12 Marks)**

b. A single phase half wave AC voltage controller has resistance load of R = 5Ω and input voltage V_S = 120 V, 60 Hz. The delay angle of thyristor is $\alpha = \frac{\pi}{3}$, determine:

(i) rms output voltage (ii) input power factor (iii) average input current **(08 Marks)**

Module-4

7 a. Demonstrate the working principle of step-down Chopper with RL load. Derive an expression for average and rms value of load voltage. **(12 Marks)**

b. A step up dc chopper has an input of 200 v and an output of 250 V. The blocking period (T_{off}) in each cycle of operation is 0.6×10^{-3} seconds. Find the period of conduction (T_{ON}) in each cycle. **(08 Marks)**

OR

8 a. Outline the different performance parameters of dc choppers. **(06 Marks)**

b. Describe class D chopper with neat diagram. **(08 Marks)**

c. Design the filter components for buck convert which has an input voltage of 12V and output voltage of 5V. The peak to peak ripple voltage is 20 mV and peak to peak ripple current of inductor is limited to 0.8A. The switching frequency is 25 kHz. **(06 Marks)**

Module-5

9 a. With the help of circuit diagram and waveforms, explain the working of single phase bridge inverters. **(12 Marks)**

b. The single phase full bridge inverter with resistive load of R = 2.4 Ω and dc input voltage V_S = 48V. Determine:

i) RMS output voltage at the fundamental frequency
ii) Output power
iii) Peak current and average current of each transistor **(08 Marks)**

OR

10 a. Outline various performance parameters used for inverters. Compare Current Source Inverter (CSI) and Variable DC link inverter. **(10 Marks)**

b. Explain AC Switches (single phase) and Microelectronic Relays (MER) with neat diagram. **(10 Marks)**

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15EC752

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
IOT and Wireless Sensor Networks

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Draw the oracle reference architecture of IoT and mention its features. **(08 Marks)**

b. Describe adaption layer gate way, data enrichment, data consolidation and device management functions. **(08 Marks)**

OR

2 a. Explain the modified OSI model for IoT/M2M systems. Explain COAP – SMS in brief. **(08 Marks)**

b. Explain the features of XMPP with neat block diagram. **(08 Marks)**

Module-2

3 a. Compare the features in IPV_4 and IPV_6. **(08 Marks)**

b. List the features of 6LOWPAN with neat diagram. **(08 Marks)**

OR

4 a. What are deployment models for cloud services for IoT applications? **(08 Marks)**

b. Explain IoT cloud based data collection, storage and computing services using Nimbits. **(08 Marks)**

Module-3

5 a. List the additional features in Intel Galileo device plat form over Arduino, Tabulate for comparing the usages and features of IDE's for Raspberry P_i. **(08 Marks)**

b. List five levels of software which need to be developed for applications and services for IoT and M2M. Write the features of Eclipse IoT stack. **(08 Marks)**

OR

6 a. What do you mean by trust? Define message privacy list the main vulnerabilities for attack? **(08 Marks)**

b. Draw layered attacker model and explain the solutions for mitigating the attacks on the layer. **(08 Marks)**

Module-4

7 a. What are the challenges for wireless sensor networks, mention required mechanisms. **(08 Marks)**

b. Explain hardware components of single node architecture of WSN with neat diagram. **(08 Marks)**

OR

8 a. Explain the transceiver structure with neat diagram and explain briefly the enabling technologies for wireless sensor networks. **(08 Marks)**

b. Explain event based programming model for WSN, what is the need for gate way? Explain how WSN is connected to internet. **(08 Marks)**

Module-5

9 a. Explain the design considerations for physical layer and transceiver in brief. Mention how the mediation device protocol is helpful for achieving low duty cycle. **(08 Marks)**

b. Explain SMACS and LEACH protocol with neat diagram. **(08 Marks)**

OR

10 a. What are the features to be considered for energy efficient routing explain in brief. **(08 Marks)**

b. Explain geographic routing in brief. **(08 Marks)**

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15EC71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Microwaves and Antennas

Time: 3 hrs. Max. Marks: 80

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Smith chart are permitted.

Module-1

1 a. Describe basic principle and working mechanism of oscillation in Reflex Klystron through Apple gate diagram. **(06 Marks)**

b. What is reflection co-efficient? Obtain an expression for the same. How it is related to standing wave ratio. **(06 Marks)**

c. A microwave transmission line has a characteristic impedance of $Z_0 = 100 \angle 53.13° \ \Omega$ when it is terminated in a unknown load impedance Z_L, the transmission coefficient was observed to be $1.09 \angle 35.34°$. Find :
i) Reflection coefficient
ii) Terminating load impedance Z_L. **(04 Marks)**

OR

2 a. What are standing waves? How are they formed? Obtain expression for voltage standing wave and phase pattern of travelling wave. **(06 Marks)**

b. A load impedance of $Z_L = 60 - j80\Omega$ is required to be matched to a 50Ω co-axial line by using a short circuited stub length 'ℓ' located at a distance 'd' from the load. The wave length of operation is 1 mtr. Using Smith chart find 'd' and 'ℓ'. **(06 Marks)**

c. Obtain expression for line impedance interms of reflection coefficient. **(04 Marks)**

Module-2

3 a. Explain with neat sketches the construction and operation of a precision type variable attenuator. **(06 Marks)**

b. Consider a losses H-plane TeeJunction with 50mw of power being fed into port(1) and other two ports(2) and (3) are terminated in matched termination. Calculate the power fed into each of the ports by the junction. **(04 Marks)**

c. Discuss applications of Magic Tee. **(06 Marks)**

OR

4 a. Explain with neat sketches the construction and operation of a H-plane TeeJunction. List the characteristics and hence derive its S Matrix. **(10 Marks)**

b. Give relations of Z, Y and ABCD parameter with S-parameter. **(06 Marks)**

Module-3

5 a. What are the losses encountered in microstriplines? Discuss briefly. **(06 Marks)**

b. Find the directivity for the following pattern :
i) Bidirectional sine squared pattern
ii) Unidirectional cosine squared pattern. **(06 Marks)**

c. Find the solid angle Ω in square degrees on a spherical surface for θ ranging between 20° and 40° and ϕ ranging between 30° and 70°. **(04 Marks)**

OR

6 a. Derive an expression for Aem for short dipole. **(06 Marks)**

b. Obtain an expression for FRIS transmission formula used in radio communication link. **(06 Marks)**

c. The normalized field pattern of an antenna is given by $E_n = \sin\theta \sin\phi$ where θ and ϕ ranges between 0 and e_{total}. Find the directivity by accurate method and approximate method. **(04 Marks)**

Module-4

7 a. Drive an expression for e total, peaks array factor, side lobes and nulls for linear uniform array for N-isotropic point sources of equal amplitude and spacing. **(06 Marks)**

b. Obtain an expression for radiation resistance of dipole. **(06 Marks)**

c. Find length of half wave dipole at 30 MHz. **(04 Marks)**

OR

8 a. Explain various forms of antenna arrays with neat diagram. **(06 Marks)**

b. A linear array consists of 4 isotropic point sources. The distance between adjacent element $\lambda/2$. The power applied with equal magnitude and phase difference – d_r obtain field pattern and find BWFN and HPBW. **(10 Marks)**

Module-5

9 a. Derive expression for field component for general loop antenna. **(06 Marks)**

b. Write general characteristics of Yagi-Uda Antenna. **(04 Marks)**

c. Calculate directivity of 20 turn helix with $\alpha = 12°$ and circumstances equal to one wave length. **(06 Marks)**

OR

10 a. With neat sketch, explain design equation of Horn Antenna. **(06 Marks)**

b. Write short note on :

i) Helical antenna

ii) Log periodic antenna. **(06 Marks)**

c. Calculate the horn parameters :

i) Length L

ii) Width a

iii) Flare angle θ

iv) Flare angle ϕ

If the month height b is 10λ.

The horn is fed by a rectangular wave guide with TE_{10} mode. **(04 Marks)**

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15EC72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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. What is Digital Image Processing? Explain in brief. **(02 Marks)**

b. With a neat block diagram, describe the fundamental steps used in image processing. **(10 Marks)**

c. Describe briefly the principle of image formation in the human eye. **(04 Marks)**

OR

2 a. Define 4-adjacency, 8- adjacency and m- adjacency. **(06 Marks)**

b. Consider the image segment shown in Fig.Q2(b).

i) Let V = {0, 1, 2} and compute the length of shortest 4, 8 and m – paths between p and q. If a particular path does not exist between these two points explain why?

ii) Repeat for V = {2, 3, 4}

	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) **(10 Marks)**

Module-2

3 a. With the help of neat graphical illustration, explain the following basic intensity transformations with their applications.

i) Image negative

ii) Log transformations

iii) Power law transformations. **(10 Marks)**

b. Explain Histogram matching technique. **(06 Marks)**

OR

4 a. What is homomorphic filtering? With block diagram, explain the homomorphic filtering approach used for image enhancement. **(10 Marks)**

b. Name and explain any three properties of two dimensional discrete Fourier transform. **(06 Marks)**

Module-3

5 a. Define the process of image restoration. Draw and explain image degradation and restoration model. **(05 Marks)**

b. Discuss adaptive median filter used in image restoration system. **(05 Marks)**

c. Explain inverse filtering used in image Restoration process. List its limitations. **(06 Marks)**

OR

6 a. Name the commonly used noise probability density functions in digital image processing and explain any four of them. **(08 Marks)**

b. Explain Wiener filtering/minimum mean square error used in image processing. **(08 Marks)**

Module-4

7 a. Explain color conversion from RGB to HIS and form HIS to RGB. **(08 Marks)**

b. What is pseudo color image processing? Explain intensity slicing technique of pseudo color image processing with geometric interpretation diagram. **(08 Marks)**

OR

8 a. With necessary diagram, explain the two band sub band coding and decoding system with its spectrum with its spectrum splitting properties used in multi-resolution analysis. **(08 Marks)**

b. With necessary diagrams describe the erosion and Dilatio process of morphological image processing. **(08 Marks)**

Module-5

9 a. Describe the canny edge detector algorithm with its basic objectives used in image edge detection process. **(08 Marks)**

b. Explain the optimum global thresholding using Otsu's algorithm used in image segmentation process. **(08 Marks)**

OR

10 a. Explain the following representation approaches

i) Boundary following

ii) Chain codes. **(08 Marks)**

b. Explain the following boundary descriptors

i) Shape number

ii) Fourier descriptor. **(08 Marks)**

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15EC73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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. Draw the control characteristics of the following:
i) SCR ii) GTO iii) MCT iv) IGBT **(08 Marks)**

b. What are the peripheral effects of power electronics equipment and mention how to overcome it? **(08 Marks)**

OR

2 a. Explain different types of power electronics converter circuits with input and output waveforms **(08 Marks)**

b. Explain the switching characteristics of IGBT and mention its advantages. **(08 Marks)**

Module-2

3 a. Explain two-transistor analogy of SCR. **(08 Marks)**

b. i) Explain the need for dv/dt and di/dt protection for SCR.
ii) A SCR circuit has the following data: v_s = 200v, dv/dt = 100v/μs, di/dt = 50 A/μs. Calculate the snubber circuit components. **(08 Marks)**

OR

4 a. Discuss dynamic turn-on and turn-off characteristics of SCR. **(08 Marks)**

b. With neat circuit diagram, explain the working of class-A self commutation with relevant waveforms. **(08 Marks)**

Module-3

5 a. Explain the operation of single-phase full converter with neat circuit diagram and waveform. Derive expression for average and rms output voltage. **(08 Marks)**

b. i) Explain how a dual-converter works in all four quadrants.
ii) A single phase dual converter is operated from a 120V, 50Hz supply and the load resistance R = 10Ω. The circulating inductance is L_r = 40mH. Delay angles are $\alpha_1 = 60^\circ$ and $\alpha_2 = 120^\circ$. Calculate the peak circulating current and the peak current of converter 1. **(08 Marks)**

OR

6 a. Explain the principles of ON-OFF control for single-phase AC voltage controller. Draw the circuit and relevant waveforms. **(08 Marks)**

b. A single phase full converter working on ON-OFF control technique has supply voltage of 230V RMS, 50Hz, load = 50Ω. The controller is ON for 30 cycles and OFF for 40 cycles. Calculate:
i) ON and OFF time intervals
ii) RMS output voltage
iii) Input pf
iv) Avg and rms thyristor currents. **(08 Marks)**

Module-4

7 a. Explain the working of step down choppers with waveforms and derive the expression for output voltage. **(08 Marks)**

b. Explain the working of boost-regulator and derive expression for average output voltage. **(08 Marks)**

OR

8 a. Explain the principle of step-up chopper. Derive expression for output voltage. **(08 Marks)**

b. I. Explain four quadrant operation of chopper.

II. Consider the switch, to be ideal in the circuit of Fig.Q.8(b), determine:

i) Duty cycle K for which $V_{0,av} = V_{0,rms}$

ii) The chopper efficiency

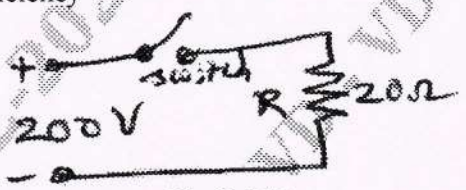

Fig.Q.8(b)

(08 Marks)

Module-5

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

b. i) Give comparison between voltage source inverter and current source inverter.

ii) Explain half bridge inverter with inductive load. **(08 Marks)**

OR

10 a. Explain the working of transistorized current source inverter. **(08 Marks)**

b. i) Explain with neat circuit variable dc link inverter. Mention its advantages and disadvantages.

ii) Considering a single phase bridge inverter if $V_s = 200v$ and $V_{01(rms)}$ is 90V, determine the delay angle β. **(08 Marks)**

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CBCS SCHEME

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15EC744

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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 all the axioms that should be obeyed by a field. Give suitable examples for fields. **(08 Marks)**

b. Find the GCD of the following pairs of numbers using Euclid's algorithm :
i) (24140, 16762) ii) (4655, 12075). **(08 Marks)**

OR

2 a. Explain the extended Euclid's algorithm to determine the multiplicative inverse of a given integer 'a' under modulo 'b'. Then determine $37^{-1} \bmod 49$ using the algorithm. **(06 Marks)**

b. Find the GCD of the polynomials $x^8 + x^5 + x^4 + x + 1$ and $x^7 + x^6 + x^5 + x + 1$ using Euclidean algorithm. **(05 Marks)**

c. Prepare tables to demonstrate addition and multiplication operations for GF(5), and hence find the additive and multiplicative inverses modulo 5. **(05 Marks)**

Module-2

3 a. What are mono-alphabetic ciphers? Explain with an example. Discuss in brief the cryptanalysis of mono-alphabetic ciphers. **(06 Marks)**

b. State the rules used for encryption in PLAYFAIR cipher and encrypt the message "WATER SCARCITY" using the keyword "SAVE" using PLAYFAIR cipher. **(08 Marks)**

c. Decrypt the cipher text "zh 2100 phhw" using Caesar cipher. **(02 Marks)**

OR

4 a. Encrypt the message "HILLCIPHER" using the key $\begin{bmatrix} 3 & 2 \\ 8 & 5 \end{bmatrix}$ using Hill cipher. **(06 Marks)**

b. Encrypt the message "WORK IS WORSHIP" using the key "MOTIVATION" using vigenere cipher. **(04 Marks)**

c. With a neat block diagram, explain the various steps involved in encryption and key generation of DES algorithm. **(06 Marks)**

Module-3

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

b. Demonstrate the following operations in AES encryption given the input state 'S'

$$S = \begin{bmatrix} 87 & F2 & 4D & 97 \\ EC & 6E & 4C & 90 \\ 4A & C3 & 46 & E7 \\ 8C & D8 & 95 & A6 \end{bmatrix}$$

and write the outcomes of each and transformation matrix is :

$$\begin{bmatrix} 2 & 3 & 1 & 1 \\ 1 & 2 & 3 & 1 \\ 1 & 1 & 2 & 3 \\ 3 & 1 & 1 & 2 \end{bmatrix}.$$

i) Shift rows ii) Mix columns. **(08 Marks)**

OR

6 a. Write briefly about :
i) Linear Congruential generators
ii) Galois - linear feedback shift register. **(06 Marks)**

b. With neat diagrams and necessary equations explain the working of :
i) Geffe generator
ii) Gellmann cascade generator. **(10 Marks)**

Module-4

7 a. If 'n' is a composite number and passes the Miller – Rabin test for the base 'a', then 'n' is called a strong pseudo -- prime to the base 'a' show that 2047 is a strong pseudo – prime to the base 2. **(04 Marks)**

b. State Fermat's and Euler's theorems and bring out the differences between the two. Also find 9^{794} mod 73 using the most relevant of the two theorems. **(06 Marks)**

c. There is a number whose value is unknown. Repeatedly divided by 5 the remainder is 3; when divided by 7 the remainder is 1; and when repeatedly divided by 8 the reminder is 6. What is the number? (Hint : Use CRT). **(06 Marks)**

OR

8 a. Using the RSA algorithm, determine the private key 'd' (or PR) and the message 'M' given the cipher text C = 66, n = 119 and public key is PU = (e = 5, 119). **(05 Marks)**

b. Give the geometric and algebraic description of addition of 2 points $P(x_1, y_1)$ and $Q(x_2, y_2)$ on an elliptic curve $E_p(a, b)$ over prime numbers. **(06 Marks)**

c. Consider a Diffie – Hellman scheme with a common prime q = 11 and a primitive 'α' = 2.
i) If user 'A' has public key $Y_A = 9$, what is A's private key?
ii) If user 'B' has public key $Y_B = 3$, what is the shared secret key 'K'? **(05 Marks)**

Module-5

9 a. With neat diagrams and related equations explain a single operation of the Secure Hash Algorithm (SHA). Common on its security. **(08 Marks)**

b. Explain briefly the process of prime number generation in the DSA algorithm. **(08 Marks)**

OR

10 a. Define one way hash functions. Mention its properties. **(04 Marks)**

b. Describe briefly discrete logarithm signature schemes. **(06 Marks)**

c. Explain the operation of MD5, with neat diagrams and relevant equations. **(06 Marks)**

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CBCS SCHEME

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15EC81

Eighth Semester B.E. Degree Examination, Jan./Feb. 2021
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 that has led to its selection for LTE. **(08 Marks)**

b. Explain the IP-based flat network architecture. **(08 Marks)**

OR

2 a. Explain the following :
i) Pathloss and shadowing
ii) Statistical and empirical channel models
iii) Doppler spread
iv) Coherence time. **(08 Marks)**

b. Explain adaptive modulation and coding with neat diagram. **(08 Marks)**

Module-2

3 a. Draw the block diagram of OFDMA downlink transmitter and explain the principle of operation. **(08 Marks)**

b. Compare OFDM – FDMA with OFDM-TDMA and OFDM-CDMA. **(08 Marks)**

OR

4 a. Explain SC-FDMA uplink transmitter with illustrative diagram. **(08 Marks)**

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

Module-3

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

b. Explain the LTE Radio Interference Protocols. **(08 Marks)**

OR

6 a. Illustrate the structure of downlink resource grid and compare with uplink resource grid. **(08 Marks)**

b. Explain the frame structure Type -1 and Type - 2. **(08 Marks)**

Module-4

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

b. Explain brief types of random access process in LTE. **(08 Marks)**

OR

8 a. Compare H-ARQ process in uplink for TDD mode and FDD mode. **(08 Marks)**

b. With neat diagram, explain SC-FDMA base band signal generation. **(08 Marks)**

Module-5

9 a. Explain the format of status PDU and MAC PDU. **(08 Marks)**

b. Explain mobility management over S1 interface. **(08 Marks)**

OR

10 a. Explain 3 basic approaches to mitigate ICI in downlink. **(08 Marks)**

b. Compare transponder mode, unacknowledged mode and Acknowledged mode of operation involved is RLC entities. **(08 Marks)**

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15EC43

Eighth Semester B.E. Degree Examination, Jan./Feb. 2021
Control System

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Compare open loop and closed loop control system and give one practical example of each. **(04 Marks)**

b. Draw the electrical network based on Torque-current analogy give all the performance equations for the Fig.Q.1(b). **(08 Marks)**

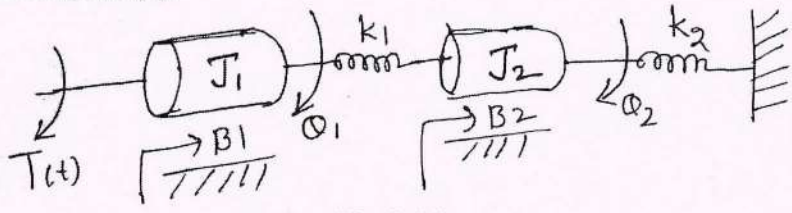

Fig.Q.1(b)

c. Write block diagram reduction rules. **(04 Marks)**

OR

2 a. Using the block diagram reduction rules find $\frac{C(s)}{R(s)}$ for the Fig.Q.2(a). **(08 Marks)**

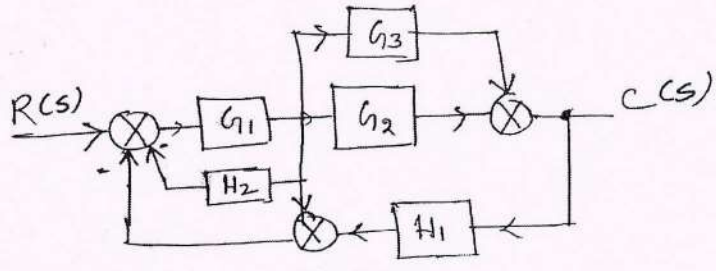

Fig.Q.2(a)

b. Obtain the T.F by using Mason's gain formula for the Fig.Q.2(b). **(08 Marks)**

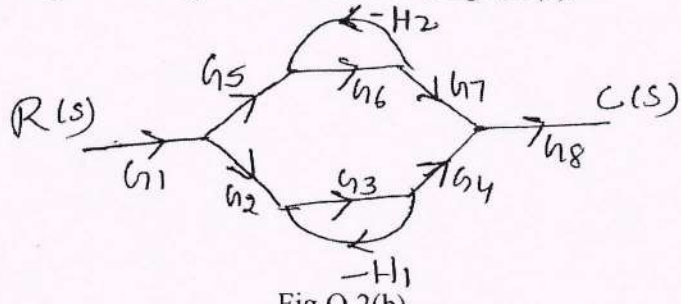

Fig.Q.2(b)

Module-2

3 a. Find K_1 so that $\epsilon = 0.35$. Find the corresponding time domain specifications for the Fig.Q.3(a). **(05 Marks)**

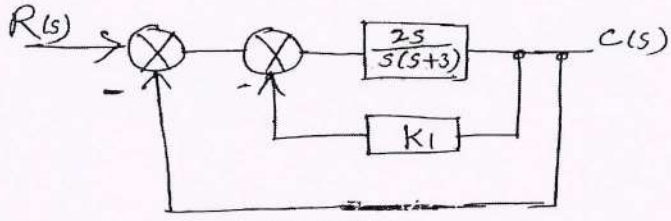

Fig.Q.3(a)

b. For unity feed back control system with $G(S) = \frac{10(s+2)}{s^2(s+1)}$. Find:

i) The static error coefficients

ii) Steady state error when the input

$$R(s) = \frac{3}{s} + \frac{2}{s^2} + \frac{1}{3s^3}$$ **(06 Marks)**

c. Draw the time response curve and define time domain specifications, for second order system for unit step input. **(05 Marks)**

OR

4 a. Explain the effect of ξ on second order system performance. **(04 Marks)**

b. Explain the effects of PI and PD controllers on the performance of second order system. **(08 Marks)**

c. Find K_P and K_V for the system with open loop transfer function as

$$G(s)H(s) = \frac{10(s+2)(s+3)}{s(s+1)(s+4)(s+5)}$$

where input is $r(t) = 3 + t$. **(04 Marks)**

Module-3

5 a. Explain basic concept of Root locus. **(03 Marks)**

b. The open loop T.F of unity feedback system is given by

$$G(s) = \frac{K(s+3)}{s(s^2+2s+3)(s+5)(s+6)}$$

Find the value of K of which closed loop system is stable. **(07 Marks)**

c. A unity feedback control system is described by the characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. Find its stability using R-H criterion. **(06 Marks)**

OR

6 a. Explain R-H criterion for determining the stability of a system and mention its limitations. **(04 Marks)**

b. A feedback control system has an open loop transfer function,

$$G(s)H(s) = \frac{K}{s(s+3)(s^2+2s+2)}$$. Draw the root locus as K varies from 0 to ∞. **(12 Marks)**

Module-4

7 a. List the limitations of lead and lag compensations. **(04 Marks)**

b. Sketch the Bode plot for the $T.F = \frac{300(s^2+2s+4)}{s(s+10)(s+20)}$ Find, phase margin and gain margin. **(08 Marks)**

c. Write a note about gain margin in brief. **(04 Marks)**

OR

8 a. Draw the polar plot of $G(s)H(s) = \frac{100}{(s+2)(s+4)(s+8)}$. **(08 Marks)**

b. Sketch the Nyquist plot for a system with $G(s)H(s) = \frac{10(s+3)}{s(s-1)}$ comment on closed loop stability. **(08 Marks)**

Module-5

9 a. Explain the sampling process with the help of unit impulse train. **(06 Marks)**

b. What is diagonalization of a matrix explain with suitable example? **(05 Marks)**

c. Obtain the state model of the system represented by the differential equation.

$$\frac{d^3y(t)}{dt^3} + 6\frac{d^2y(t)}{dt^2} + 11\frac{dy(t)}{dt} + 10y(t) = 3u(t)$$ **(05 Marks)**

OR

10 a. Define the following terms:

i) State variable

ii) State space

iii) State trajectory. **(06 Marks)**

b. Obtain the state model of the given electrical system for the Fig.Q.10(b) **(06 Marks)**

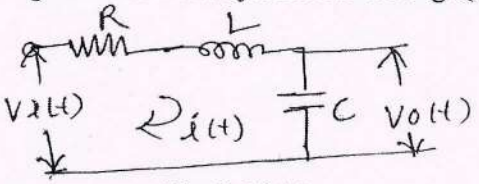

Fig.Q.10(b)

c. State the advantages and disadvantages of digital control system. **(04 Marks)**

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Eighth Semester B.E. Degree Examination, Jan./Feb. 2(

Network Security

Time: 3 hrs. Max

Note: ***Answer any FIVE full questions, selecting atleast TWO questions fro***

PART – A

1 a. Discuss the OSI Security Architecture focusing on security mechanism attacks.

b. With a neat diagram, discuss the function of Network Security model. List th designing security model.

2 a. Explain block cipher design principle.

b. With a neat diagram, explain the single round of DES encryption.

c. Discuss the evaluation criteria for Advanced Encryption Standard.

3 a. Discuss with illustrations i) Prime curves defined over Zp ii) Binary cur over GF (2^n) iii) Elliptic Curve Encryption and decryption.

b. Describe RSA Algorithm and discuss the security of RSA.

4 Write short notes on :

a. Authentication function b) Hash function

c. Authentication protocols d) Digital signature standard.

PART – B

5 a. Explain SSL protocol stack with a neat diagram and define the different par session and states.

b. Explain in detail the transactions supported by SET protocol.

6 a. Write short notes on :

i) Statistical anomaly detection ii) Rule based intrusion detection.

b. What are different techniques employed in choosing passwords? Compar merits.

7 a. Give the taxonomy of malicious programs. List the software threats and

b. Discuss the following : i) Email viruses ii) Digital Immune Systems.

8 a. What is a Firewall? Explain the various types of firewall configurations diagrams.

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17EC71

Seventh Semester B.E. Degree Examination, Jan./Feb.2021
Microwave and Antennas

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With neat diagram, explain construction and operation of reflex Klystron. **(10 Marks)**

b. Define and derive an expression for reflection coefficient when the transmission line is terminated by load impedence (Z_L). **(06 Marks)**

c. A transmission line working at RF has following constants, L = 9 μH/m, C = 16 PF/m the line is terminated in a resistive load of 1000 Ω. Find the reflection coefficient and standing wave ratio. **(04 Marks)**

OR

2 a. Explain the different mode current of reflex klystron. **(06 Marks)**

b. Show the relationship between standing wave ratio and reflection coefficient. **(06 Marks)**

c. A transmission line has the following primary constants per km of the line, R = 8 Ω, G = 0.1 μ℧, L = 3.5 mH and C = 9 nF. Calculate Z_0, α, β, VP and λ at W = 5000 rad/sec. **(08 Marks)**

Module-2

3 a. Define the following losses in microwave interms of s-parameters. (i) Transmission loss (ii) Reflection loss (iii) Return loss (iv) Insertion loss **(06 Marks)**

b. Explain S-matrix representation for multi port network. **(06 Marks)**

c. State the properties of S-parameters, prove the symmetry property and unitary property of S-parameter. **(08 Marks)**

OR

4 a. With a neat diagram, explain rotary precision phase shifter. **(06 Marks)**

b. What is magic tee? Explain magic tee and derive an S-matrix. Mention its application. **(08 Marks)**

c. Explain different types of co-axial connectors in microwave circuits. **(06 Marks)**

Module-3

5 a. What are the losses in microstrip lines? Explain the radiation losses. **(08 Marks)**

b. Show that the maximum effective aperture of a short dipole is $0.119\lambda^2$. **(06 Marks)**

c. Obtain the expression for inductance, capacitance and hence characteristic impedance of a parallel strip line. **(06 Marks)**

OR

6 a. Derive characteristic impedance of microstrip line with diagram. **(06 Marks)**

b. Using power theorem find the directivity for the source with unidirectional cosine square power pattern. $U(\theta,\phi) = U_m \cos^2\theta$. **(06 Marks)**

c. Explain the following parameters with respect to antenna:
(i) Directivity (ii) Beam area (iii) Radiation intensity (iv) Beam efficiency **(08 Marks)**

Module-4

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

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

c. A source has a radiation intensity pattern given by $U = U_m \sin\theta$ for $0 \le \theta \ge \frac{\pi}{2}$ and $0 \le \phi \le 2\pi$, find the power and directivity. **(06 Marks)**

OR

8 a. Derive an expression and draw the field pattern of two isotropic point sources of same amplitude and phase. **(08 Marks)**

b. Obtain the expression for field of dipole in general for the case of thin linear antenna. **(06 Marks)**

c. For a short dipole $\frac{\lambda}{15}$ long find the efficiency, radiation resistance if loss resistance is 1 Ω and also find the (i) Maximum effective aperture (ii) Efficiency (iii) Radiation resistance. **(06 Marks)**

Module-5

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

b. Determine the directivity of loop antenna having radius 1.0 m when it is operated at 0.9 MHz. **(04 Marks)**

c. Discuss the following:

(i) Yagi Uda antenna.

(ii) Log periodic antenna. **(08 Marks)**

OR

10 a. Explain Helical geometry with diagram and practical consideration for the manofillar axial mode helical antenna. **(08 Marks)**

b. Derive the expression of far field equation of small loop antenna, with diagram. **(08 Marks)**

c. Find the radiation resistance of a loop antenna with diameter 0.5 m operating frequency at 1 MHz. **(04 Marks)**

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17EC72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Digital Image Processing

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain with block diagram, the fundamental steps used in digital image processing. **(10 Marks)**

b. Explain with relevant diagrams, different sensor arrangements. **(10 Marks)**

OR

2 a. Explain the process of sampling and quantization, with relevant diagrams. **(10 Marks)**

b. Define following: (i) Spatial and Intensity Resolution (ii) 4-, 8- and m-adjacency (iii) Euclidean distance, city-block distance and chessboard distance **(10 Marks)**

Module-2

3 a. Explain with plots, some basic intensity transformation functions. **(10 Marks)**

b. With relevant equations, discuss the discrete Laplacian of two variables and different implementation of Laplacian operator masks. **(10 Marks)**

OR

4 a. Discuss with relevant diagrams, the image smoothing using the frequency domain low pass filters (i) Ideal (ii) Butterworth (iii) Gaussian **(10 Marks)**

b. Explain the following selective filter: (i) Bandreject and Bandpass Filters (ii) Notch Filters **(10 Marks)**

Module-3

5 a. Discuss various noise models with respect to image restoration process. **(10 Marks)**

b. Explain the following methods for estimating degradation function: (i) Estimation by image observation (ii) Estimation by experimentation **(10 Marks)**

OR

6 a. Explain the process of restoration of images using Inverse Filtering technique. **(10 Marks)**

b. Explain with relevant equations, Minimum Mean Square Error (Wiener) Filtering. **(10 Marks)**

Module-4

7 a. Explain the following color models: (i) RGB (ii) HSI **(10 Marks)**

b. Explain Pseudocolor Image Processing. **(10 Marks)**

OR

8 a. Explain the following Morphological operations: (i) Erosion (ii) Dilation (iii) Opening (iv) closing **(10 Marks)**

b. Explain multi-resolution expansions used in image processing. **(10 Marks)**

Module-5

9 a. Explain Thresholding based segmentation. Discuss: (i) Global Thresholding (ii) Adaptive Thresholding **(10 Marks)**

b. Explain segmentation of images using Morphological Watersheds. **(10 Marks)**

OR

10 a. Explain Chain Codes used to represent a boundary. **(10 Marks)**

b. Discuss various approaches of boundary description. **(10 Marks)**

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17EC73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Power Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw the symbols and the V-I characteristics of the following power semiconductor devices: (i) Diode (ii) Thyristor (SCR) (iii) SITH (iv) GTO (v) TRIAC **(10 Marks)**

b. Explain peripheral effects of power electronic components and equipment, mention how to eliminate them. **(06 Marks)**

c. List out different applications of power electronic system. **(04 Marks)**

OR

2 a. Explain the important characteristic features of power transistors and discuss different operating ranges of power BJT with the aid of output and transfer characteristic. **(10 Marks)**

b. Illustrate the switching characteristics of power MOSFET with necessary waveforms. **(10 Marks)**

Module-2

3 a. Describe modes of operation of SCR with a neat V-I characteristic. **(10 Marks)**

b. Develop two transistor model and derive an expression for anode current in terms of transistor parameters for a thyristor. **(10 Marks)**

OR

4 a. Illustrate with neat diagrams and waveforms, the operation of UJT triggering circuit for SCR. **(10 Marks)**

b. Estimate the required parameter for Snubber circuit to provide $\frac{dv}{dt}$ protection to SCR used in single phase bridge converter; the SCR has a maximum $\frac{dv}{dt}$ of 60 V/Msec. the input line to line voltage has peak value of 425 V and series inductance of 0.2 mH. **(05 Marks)**

c. Compare natural commutation and forced commutation. **(05 Marks)**

Module-3

5 a. Describe with neat diagram and waveforms, half wave controlled rectifier with freewheeling diode and obtain average value of output voltage. **(12 Marks)**

b. A single phase full converter is operated from 120 V, 60 Hz supply. The load current with an average value of I_a is continuous with negligible ripple current. If turn ON ratio of transformer is unity with delay angle $\alpha = \frac{\pi}{3}$. Calculate:

(i) Harmonic Factor (HF) of input current
(ii) Displacement Factor (DF)
(iii) Supply Power Factor (PF) **(08 Marks)**

OR

6 a. Illustrate with neat circuit diagram and waveforms, the working principle of single phase AC voltage controller using phase control. Obtain average value of output voltage for single phase half wave controller. **(12 Marks)**

b. A single phase half wave AC voltage controller has resistance load of R = 5Ω and input voltage V_S = 120 V, 60 Hz. The delay angle of thyristor is $\alpha = \frac{\pi}{3}$, determine:

(i) rms output voltage (ii) input power factor (iii) average input current **(08 Marks)**

Module-4

7 a. Demonstrate the working principle of step-down Chopper with RL load. Derive an expression for average and rms value of load voltage. **(12 Marks)**

b. A step up dc chopper has an input of 200 v and an output of 250 V. The blocking period (T_{off}) in each cycle of operation is 0.6×10^{-3} seconds. Find the period of conduction (T_{ON}) in each cycle. **(08 Marks)**

OR

8 a. Outline the different performance parameters of dc choppers. **(06 Marks)**

b. Describe class D chopper with neat diagram. **(08 Marks)**

c. Design the filter components for buck convert which has an input voltage of 12V and output voltage of 5V. The peak to peak ripple voltage is 20 mV and peak to peak ripple current of inductor is limited to 0.8A. The switching frequency is 25 kHz. **(06 Marks)**

Module-5

9 a. With the help of circuit diagram and waveforms, explain the working of single phase bridge inverters. **(12 Marks)**

b. The single phase full bridge inverter with resistive load of R = 2.4 Ω and dc input voltage V_S = 48V. Determine:

i) RMS output voltage at the fundamental frequency
ii) Output power
iii) Peak current and average current of each transistor **(08 Marks)**

OR

10 a. Outline various performance parameters used for inverters. Compare Current Source Inverter (CSI) and Variable DC link inverter. **(10 Marks)**

b. Explain AC Switches (single phase) and Microelectronic Relays (MER) with neat diagram. **(10 Marks)**

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17EC744

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Cryptography

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. What is Divisibility? Explain the division algorithm with suitable example. **(06 Marks)**
b. Explain with examples the properties of modular Arithmetic. **(06 Marks)**
c. Write a note on Finite field of the Form GF(P). **(08 Marks)**

OR

2 a. Write the Arithmetic addition modulo and multiplication module for GF (2^4). **(06 Marks)**
b. With suitable example, explain the polynomial Arithmetic with co-efficient in Z_P. **(08 Marks)**
c. What are Groups? Explain in detail with respect to its properties. **(06 Marks)**

Module-2

3 a. With a neat sketch, explain the model of symmetric cryptosystems. **(06 Marks)**
b. For the keyword "ELECTRONICS", Give the cipher text for the plain text "COMMUNICATION ENGINEERING", using play fair cipher. Explain the rules for play fair cipher. **(10 Marks)**
c. Explain with an example, how the transposition technique is used to convert PT to CT. **(04 Marks)**

OR

4 a. What is Stegnography? Explain different methods adopted in stegnography. **(06 Marks)**
b. Explain simplified DES algorithm with a neat block diagram. **(08 Marks)**
c. Explain with suitable sketch, the concept of Feistel encryption and decryption. **(06 Marks)**

Module-3

5 a. List and explain the algorithm and characteristics implementation and AES. **(08 Marks)**
b. Explain the Key-Block-Round combination analysis in AES. **(06 Marks)**
c. Explain the concept of AES encryption single Round stages. **(06 Marks)**

OR

6 a. Explain in detail the nonlinear shift Register. **(06 Marks)**
b. Write an explanatory note on Linear Feed Back Shift Registers. **(10 Marks)**
c. Compare different LFSR boxed stream ciphers for its ryptographical weaknesses. **(04 Marks)**

Module-4

7 a. Find the GCD of (1970, 1066) using Euclid's method. **(04 Marks)**
b. With suitable explanation prove Euler's theorem. **(07 Marks)**
c. Explain Chaises Remainder Theorem and its features. **(09 Marks)**

OR

8 a. Explain the complete steps involved for encryption key Generation and Decryption for RSA algorithm. **(08 Marks)**

b. What is Key Management? Explain DH key exchange mechanism. **(08 Marks)**

c. Users A and B use the DH key exchange technique. A common prime Q = 353 and a primitive root $\alpha = 3$, If A select private key $X_A = 97$ and B selects private key $X_B = 233$, then, what is public key Y_A of A and public key Y_B. Calculate shared secret key 'K'. **(04 Marks)**

Module-5

9 a. What are one way Hash Functions? Explain in detail one way hash function using symmetric block algorithms. **(08 Marks)**

b. Write an explanatory note on MAC. **(06 Marks)**

c. Briefly explain the security threats on Hash function and MAC. **(06 Marks)**

OR

10 a. Explain in detail Direct Digital Signature and Arbitrated Digital Signature. **(08 Marks)**

b. Explain with suitable sketch, Discrete Logarithm signature scheme. **(06 Marks)**

c. Briefly, explain the signing and verifying the Digital Signature Algorithm (DSA). **(06 Marks)**

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15EC752

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
IOT and Wireless Sensor Networks

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Draw the oracle reference architecture of IoT and mention its features. **(08 Marks)**

b. Describe adaption layer gate way, data enrichment, data consolidation and device management functions. **(08 Marks)**

OR

2 a. Explain the modified OSI model for IoT/M2M systems. Explain COAP – SMS in brief. **(08 Marks)**

b. Explain the features of XMPP with neat block diagram. **(08 Marks)**

Module-2

3 a. Compare the features in IPV_4 and IPV_6. **(08 Marks)**

b. List the features of 6LOWPAN with neat diagram. **(08 Marks)**

OR

4 a. What are deployment models for cloud services for IoT applications? **(08 Marks)**

b. Explain IoT cloud based data collection, storage and computing services using Nimbits. **(08 Marks)**

Module-3

5 a. List the additional features in Intel Galileo device plat form over Arduino, Tabulate for comparing the usages and features of IDE's for Raspberry P_i. **(08 Marks)**

b. List five levels of software which need to be developed for applications and services for IoT and M2M. Write the features of Eclipse IoT stack. **(08 Marks)**

OR

6 a. What do you mean by trust? Define message privacy list the main vulnerabilities for attack? **(08 Marks)**

b. Draw layered attacker model and explain the solutions for mitigating the attacks on the layer. **(08 Marks)**

Module-4

7 a. What are the challenges for wireless sensor networks, mention required mechanisms. **(08 Marks)**

b. Explain hardware components of single node architecture of WSN with neat diagram. **(08 Marks)**

OR

8 a. Explain the transceiver structure with neat diagram and explain briefly the enabling technologies for wireless sensor networks. **(08 Marks)**

b. Explain event based programming model for WSN, what is the need for gate way? Explain how WSN is connected to internet. **(08 Marks)**

Module-5

9 a. Explain the design considerations for physical layer and transceiver in brief. Mention how the mediation device protocol is helpful for achieving low duty cycle. **(08 Marks)**

b. Explain SMACS and LEACH protocol with neat diagram. **(08 Marks)**

OR

10 a. What are the features to be considered for energy efficient routing explain in brief. **(08 Marks)**

b. Explain geographic routing in brief. **(08 Marks)**

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15EC71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Microwaves and Antennas

Time: 3 hrs. Max. Marks: 80

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. Smith chart are permitted.

Module-1

1 a. Describe basic principle and working mechanism of oscillation in Reflex Klystron through Apple gate diagram. **(06 Marks)**

b. What is reflection co-efficient? Obtain an expression for the same. How it is related to standing wave ratio. **(06 Marks)**

c. A microwave transmission line has a characteristic impedance of $Z_0 = 100 \angle 53.13° \ \Omega$ when it is terminated in a unknown load impedance Z_L, the transmission coefficient was observed to be $1.09 \angle 35.34°$. Find :
i) Reflection coefficient
ii) Terminating load impedance Z_L. **(04 Marks)**

OR

2 a. What are standing waves? How are they formed? Obtain expression for voltage standing wave and phase pattern of travelling wave. **(06 Marks)**

b. A load impedance of $Z_L = 60 - j80\Omega$ is required to be matched to a 50Ω co-axial line by using a short circuited stub length 'ℓ' located at a distance 'd' from the load. The wave length of operation is 1 mtr. Using Smith chart find 'd' and 'ℓ'. **(06 Marks)**

c. Obtain expression for line impedance interms of reflection coefficient. **(04 Marks)**

Module-2

3 a. Explain with neat sketches the construction and operation of a precision type variable attenuator. **(06 Marks)**

b. Consider a losses H-plane TeeJunction with 50mw of power being fed into port(1) and other two ports(2) and (3) are terminated in matched termination. Calculate the power fed into each of the ports by the junction. **(04 Marks)**

c. Discuss applications of Magic Tee. **(06 Marks)**

OR

4 a. Explain with neat sketches the construction and operation of a H-plane TeeJunction. List the characteristics and hence derive its S Matrix. **(10 Marks)**

b. Give relations of Z, Y and ABCD parameter with S-parameter. **(06 Marks)**

Module-3

5 a. What are the losses encountered in microstriplines? Discuss briefly. **(06 Marks)**

b. Find the directivity for the following pattern :
i) Bidirectional sine squared pattern
ii) Unidirectional cosine squared pattern. **(06 Marks)**

c. Find the solid angle Ω in square degrees on a spherical surface for θ ranging between 20° and 40° and ϕ ranging between 30° and 70°. **(04 Marks)**

OR

6 a. Derive an expression for Aem for short dipole. **(06 Marks)**

b. Obtain an expression for FRIS transmission formula used in radio communication link. **(06 Marks)**

c. The normalized field pattern of an antenna is given by $E_n = \sin\theta \sin\phi$ where θ and ϕ ranges between 0 and e_{total}. Find the directivity by accurate method and approximate method. **(04 Marks)**

Module-4

7 a. Drive an expression for e total, peaks array factor, side lobes and nulls for linear uniform array for N-isotropic point sources of equal amplitude and spacing. **(06 Marks)**

b. Obtain an expression for radiation resistance of dipole. **(06 Marks)**

c. Find length of half wave dipole at 30 MHz. **(04 Marks)**

OR

8 a. Explain various forms of antenna arrays with neat diagram. **(06 Marks)**

b. A linear array consists of 4 isotropic point sources. The distance between adjacent element $\lambda/2$. The power applied with equal magnitude and phase difference – d_r obtain field pattern and find BWFN and HPBW. **(10 Marks)**

Module-5

9 a. Derive expression for field component for general loop antenna. **(06 Marks)**

b. Write general characteristics of Yagi-Uda Antenna. **(04 Marks)**

c. Calculate directivity of 20 turn helix with $\alpha = 12°$ and circumstances equal to one wave length. **(06 Marks)**

OR

10 a. With neat sketch, explain design equation of Horn Antenna. **(06 Marks)**

b. Write short note on :

i) Helical antenna

ii) Log periodic antenna. **(06 Marks)**

c. Calculate the horn parameters :

i) Length L

ii) Width a

iii) Flare angle θ

iv) Flare angle ϕ

If the month height b is 10λ.

The horn is fed by a rectangular wave guide with TE_{10} mode. **(04 Marks)**

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15EC72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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. What is Digital Image Processing? Explain in brief. **(02 Marks)**

b. With a neat block diagram, describe the fundamental steps used in image processing. **(10 Marks)**

c. Describe briefly the principle of image formation in the human eye. **(04 Marks)**

OR

2 a. Define 4-adjacency, 8- adjacency and m- adjacency. **(06 Marks)**

b. Consider the image segment shown in Fig.Q2(b).

i) Let V = {0, 1, 2} and compute the length of shortest 4, 8 and m – paths between p and q. If a particular path does not exist between these two points explain why?

ii) Repeat for V = {2, 3, 4}

	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) **(10 Marks)**

Module-2

3 a. With the help of neat graphical illustration, explain the following basic intensity transformations with their applications.

i) Image negative

ii) Log transformations

iii) Power law transformations. **(10 Marks)**

b. Explain Histogram matching technique. **(06 Marks)**

OR

4 a. What is homomorphic filtering? With block diagram, explain the homomorphic filtering approach used for image enhancement. **(10 Marks)**

b. Name and explain any three properties of two dimensional discrete Fourier transform. **(06 Marks)**

Module-3

5 a. Define the process of image restoration. Draw and explain image degradation and restoration model. **(05 Marks)**

b. Discuss adaptive median filter used in image restoration system. **(05 Marks)**

c. Explain inverse filtering used in image Restoration process. List its limitations. **(06 Marks)**

OR

6 a. Name the commonly used noise probability density functions in digital image processing and explain any four of them. **(08 Marks)**

b. Explain Wiener filtering/minimum mean square error used in image processing. **(08 Marks)**

Module-4

7 a. Explain color conversion from RGB to HIS and form HIS to RGB. **(08 Marks)**

b. What is pseudo color image processing? Explain intensity slicing technique of pseudo color image processing with geometric interpretation diagram. **(08 Marks)**

OR

8 a. With necessary diagram, explain the two band sub band coding and decoding system with its spectrum with its spectrum splitting properties used in multi-resolution analysis. **(08 Marks)**

b. With necessary diagrams describe the erosion and Dilatio process of morphological image processing. **(08 Marks)**

Module-5

9 a. Describe the canny edge detector algorithm with its basic objectives used in image edge detection process. **(08 Marks)**

b. Explain the optimum global thresholding using Otsu's algorithm used in image segmentation process. **(08 Marks)**

OR

10 a. Explain the following representation approaches

i) Boundary following

ii) Chain codes. **(08 Marks)**

b. Explain the following boundary descriptors

i) Shape number

ii) Fourier descriptor. **(08 Marks)**

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15EC73

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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. Draw the control characteristics of the following:
i) SCR ii) GTO iii) MCT iv) IGBT **(08 Marks)**

b. What are the peripheral effects of power electronics equipment and mention how to overcome it? **(08 Marks)**

OR

2 a. Explain different types of power electronics converter circuits with input and output waveforms **(08 Marks)**

b. Explain the switching characteristics of IGBT and mention its advantages. **(08 Marks)**

Module-2

3 a. Explain two-transistor analogy of SCR. **(08 Marks)**

b. i) Explain the need for dv/dt and di/dt protection for SCR.
ii) A SCR circuit has the following data: v_s = 200v, dv/dt = 100v/μs, di/dt = 50 A/μs. Calculate the snubber circuit components. **(08 Marks)**

OR

4 a. Discuss dynamic turn-on and turn-off characteristics of SCR. **(08 Marks)**

b. With neat circuit diagram, explain the working of class-A self commutation with relevant waveforms. **(08 Marks)**

Module-3

5 a. Explain the operation of single-phase full converter with neat circuit diagram and waveform. Derive expression for average and rms output voltage. **(08 Marks)**

b. i) Explain how a dual-converter works in all four quadrants.
ii) A single phase dual converter is operated from a 120V, 50Hz supply and the load resistance R = 10Ω. The circulating inductance is L_r = 40mH. Delay angles are $\alpha_1 = 60^\circ$ and $\alpha_2 = 120^\circ$. Calculate the peak circulating current and the peak current of converter 1. **(08 Marks)**

OR

6 a. Explain the principles of ON-OFF control for single-phase AC voltage controller. Draw the circuit and relevant waveforms. **(08 Marks)**

b. A single phase full converter working on ON-OFF control technique has supply voltage of 230V RMS, 50Hz, load = 50Ω. The controller is ON for 30 cycles and OFF for 40 cycles. Calculate:
i) ON and OFF time intervals
ii) RMS output voltage
iii) Input pf
iv) Avg and rms thyristor currents. **(08 Marks)**

Module-4

7 a. Explain the working of step down choppers with waveforms and derive the expression for output voltage. **(08 Marks)**

b. Explain the working of boost-regulator and derive expression for average output voltage. **(08 Marks)**

OR

8 a. Explain the principle of step-up chopper. Derive expression for output voltage. **(08 Marks)**

b. I. Explain four quadrant operation of chopper.

II. Consider the switch, to be ideal in the circuit of Fig.Q.8(b), determine:

i) Duty cycle K for which $V_{0\,av} = V_{0,rms}$

ii) The chopper efficiency

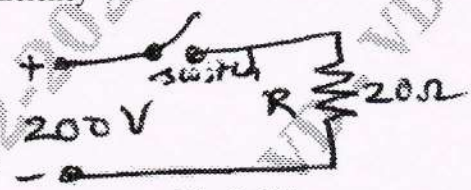

Fig.Q.8(b)

(08 Marks)

Module-5

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

b. i) Give comparison between voltage source inverter and current source inverter.

ii) Explain half bridge inverter with inductive load. **(08 Marks)**

OR

10 a. Explain the working of transistorized current source inverter. **(08 Marks)**

b. i) Explain with neat circuit variable dc link inverter. Mention its advantages and disadvantages.

ii) Considering a single phase bridge inverter if V_s = 200v and $V_{01(rms)}$ is 90V, determine the delay angle β. **(08 Marks)**

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15EC744

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
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 all the axioms that should be obeyed by a field. Give suitable examples for fields. **(08 Marks)**

b. Find the GCD of the following pairs of numbers using Euclid's algorithm :
i) (24140, 16762) ii) (4655, 12075). **(08 Marks)**

OR

2 a. Explain the extended Euclid's algorithm to determine the multiplicative inverse of a given integer 'a' under modulo 'b'. Then determine 37^{-1} mod 49 using the algorithm. **(06 Marks)**

b. Find the GCD of the polynomials $x^8 + x^5 + x^4 + x + 1$ and $x^7 + x^6 + x^5 + x + 1$ using Euclidean algorithm. **(05 Marks)**

c. Prepare tables to demonstrate addition and multiplication operations for GF(5), and hence find the additive and multiplicative inverses modulo 5. **(05 Marks)**

Module-2

3 a. What are mono-alphabetic ciphers? Explain with an example. Discuss in brief the cryptanalysis of mono-alphabetic ciphers. **(06 Marks)**

b. State the rules used for encryption in PLAYFAIR cipher and encrypt the message "WATER SCARCITY" using the keyword "SAVE" using PLAYFAIR cipher. **(08 Marks)**

c. Decrypt the cipher text "zh 2100 phhw" using Caesar cipher. **(02 Marks)**

OR

4 a. Encrypt the message "HILLCIPHER" using the key $\begin{bmatrix} 3 & 2 \\ 8 & 5 \end{bmatrix}$ using Hill cipher. **(06 Marks)**

b. Encrypt the message "WORK IS WORSHIP" using the key "MOTIVATION" using vigenere cipher. **(04 Marks)**

c. With a neat block diagram, explain the various steps involved in encryption and key generation of DES algorithm. **(06 Marks)**

Module-3

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

b. Demonstrate the following operations in AES encryption given the input state 'S'

$S =$

87	F2	4D	97
EC	6E	4C	90
4A	C3	46	E7
8C	D8	95	A6

and write the outcomes of each and transformation matrix is :

$$\begin{bmatrix} 2 & 3 & 1 & 1 \\ 1 & 2 & 3 & 1 \\ 1 & 1 & 2 & 3 \\ 3 & 1 & 1 & 2 \end{bmatrix}.$$

i) Shift rows ii) Mix columns. **(08 Marks)**

OR

6 a. Write briefly about :
i) Linear Congruential generators
ii) Galois - linear feedback shift register. **(06 Marks)**

b. With neat diagrams and necessary equations explain the working of :
i) Geffe generator
ii) Gellmann cascade generator. **(10 Marks)**

Module-4

7 a. If 'n' is a composite number and passes the Miller – Rabin test for the base 'a', then 'n' is called a strong pseudo – prime to the base 'a' show that 2047 is a strong pseudo – prime to the base 2. **(04 Marks)**

b. State Fermat's and Euler's theorems and bring out the differences between the two. Also find 9^{794} mod 73 using the most relevant of the two theorems. **(06 Marks)**

c. There is a number whose value is unknown. Repeatedly divided by 5 the remainder is 3; when divided by 7 the remainder is 1; and when repeatedly divided by 8 the reminder is 6. What is the number? (Hint : Use CRT). **(06 Marks)**

OR

8 a. Using the RSA algorithm, determine the private key 'd' (or PR) and the message 'M' given the cipher text C = 66, n = 119 and public key is PU = (e = 5, 119). **(05 Marks)**

b. Give the geometric and algebraic description of addition of 2 points $P(x_1, y_1)$ and $Q(x_2, y_2)$ on an elliptic curve $E_p(a, b)$ over prime numbers. **(06 Marks)**

c. Consider a Diffie – Hellman scheme with a common prime q = 11 and a primitive 'α' = 2.
i) If user 'A' has public key $Y_A = 9$, what is A's private key?
ii) If user 'B' has public key $Y_B = 3$, what is the shared secret key 'K'? **(05 Marks)**

Module-5

9 a. With neat diagrams and related equations explain a single operation of the Secure Hash Algorithm (SHA). Common on its security. **(08 Marks)**

b. Explain briefly the process of prime number generation in the DSA algorithm. **(08 Marks)**

OR

10 a. Define one way hash functions. Mention its properties. **(04 Marks)**

b. Describe briefly discrete logarithm signature schemes. **(06 Marks)**

c. Explain the operation of MD5, with neat diagrams and relevant equations. **(06 Marks)**

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15EC81

Eighth Semester B.E. Degree Examination, Jan./Feb. 2021
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 that has led to its selection for LTE. **(08 Marks)**

b. Explain the IP-based flat network architecture. **(08 Marks)**

OR

2 a. Explain the following :
i) Pathloss and shadowing
ii) Statistical and empirical channel models
iii) Doppler spread
iv) Coherence time. **(08 Marks)**

b. Explain adaptive modulation and coding with neat diagram. **(08 Marks)**

Module-2

3 a. Draw the block diagram of OFDMA downlink transmitter and explain the principle of operation. **(08 Marks)**

b. Compare OFDM – FDMA with OFDM-TDMA and OFDM-CDMA. **(08 Marks)**

OR

4 a. Explain SC-FDMA uplink transmitter with illustrative diagram. **(08 Marks)**

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

Module-3

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

b. Explain the LTE Radio Interference Protocols. **(08 Marks)**

OR

6 a. Illustrate the structure of downlink resource grid and compare with uplink resource grid. **(08 Marks)**

b. Explain the frame structure Type -1 and Type - 2. **(08 Marks)**

Module-4

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

b. Explain brief types of random access process in LTE. **(08 Marks)**

OR

8 a. Compare H-ARQ process in uplink for TDD mode and FDD mode. **(08 Marks)**

b. With neat diagram, explain SC-FDMA base band signal generation. **(08 Marks)**

Module-5

9 a. Explain the format of status PDU and MAC PDU. **(08 Marks)**

b. Explain mobility management over S1 interface. **(08 Marks)**

OR

10 a. Explain 3 basic approaches to mitigate ICI in downlink. **(08 Marks)**

b. Compare transponder mode, unacknowledged mode and Acknowledged mode of operation involved is RLC entities. **(08 Marks)**

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15EC43

Eighth Semester B.E. Degree Examination, Jan./Feb. 2021
Control System

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Compare open loop and closed loop control system and give one practical example of each. **(04 Marks)**

b. Draw the electrical network based on Torque-current analogy give all the performance equations for the Fig.Q.1(b). **(08 Marks)**

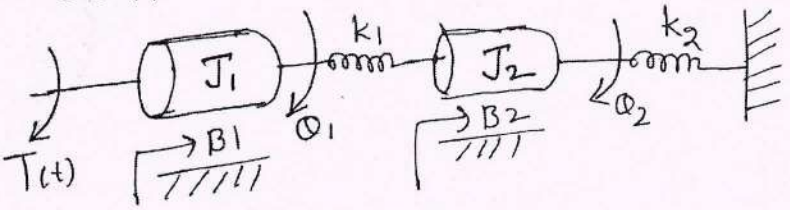

Fig.Q.1(b)

c. Write block diagram reduction rules. **(04 Marks)**

OR

2 a. Using the block diagram reduction rules find $\frac{C(s)}{R(s)}$ for the Fig.Q.2(a). **(08 Marks)**

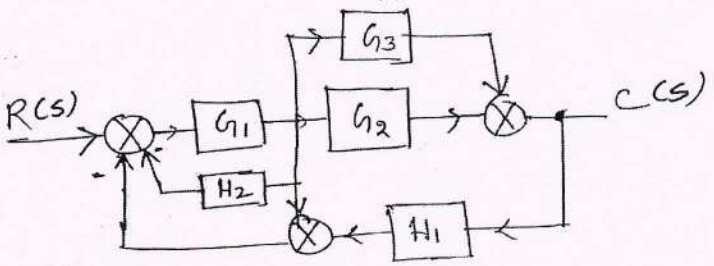

Fig.Q.2(a)

b. Obtain the T.F by using Mason's gain formula for the Fig.Q.2(b). **(08 Marks)**

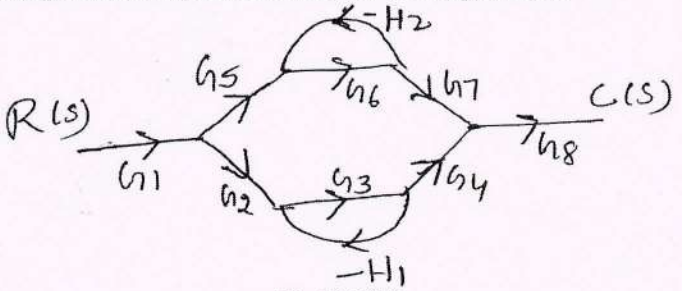

Fig.Q.2(b)

Module-2

3 a. Find K_1 so that $\epsilon = 0.35$. Find the corresponding time domain specifications for the Fig.Q.3(a). **(05 Marks)**

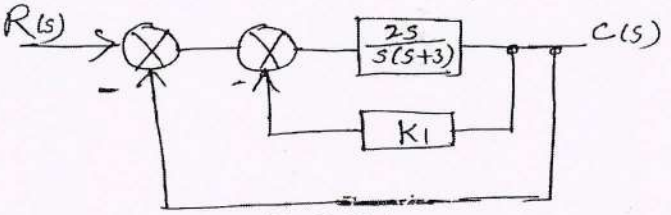

Fig.Q.3(a)

b. For unity feed back control system with $G(S) = \frac{10(s+2)}{s^2(s+1)}$. Find:

i) The static error coefficients

ii) Steady state error when the input

$$R(s) = \frac{3}{s} + \frac{2}{s^2} + \frac{1}{3s^3}$$ **(06 Marks)**

c. Draw the time response curve and define time domain specifications, for second order system for unit step input. **(05 Marks)**

OR

4 a. Explain the effect of ξ on second order system performance. **(04 Marks)**

b. Explain the effects of PI and PD controllers on the performance of second order system. **(08 Marks)**

c. Find K_P and K_V for the system with open loop transfer function as

$$G(s)H(s) = \frac{10(s+2)(s+3)}{s(s+1)(s+4)(s+5)}$$

where input is $r(t) = 3 + t$. **(04 Marks)**

Module-3

5 a. Explain basic concept of Root locus. **(03 Marks)**

b. The open loop T.F of unity feedback system is given by

$$G(s) = \frac{K(s+3)}{s(s^2+2s+3)(s+5)(s+6)}$$

Find the value of K of which closed loop system is stable. **(07 Marks)**

c. A unity feedback control system is described by the characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. Find its stability using R-H criterion. **(06 Marks)**

OR

6 a. Explain R-H criterion for determining the stability of a system and mention its limitations. **(04 Marks)**

b. A feedback control system has an open loop transfer function,

$$G(s)H(s) = \frac{K}{s(s+3)(s^2+2s+2)}$$. Draw the root locus as K varies from 0 to ∞. **(12 Marks)**

Module-4

7 a. List the limitations of lead and lag compensations. **(04 Marks)**

b. Sketch the Bode plot for the $T.F = \frac{300(s^2+2s+4)}{s(s+10)(s+20)}$ Find, phase margin and gain margin. **(08 Marks)**

c. Write a note about gain margin in brief. **(04 Marks)**

OR

8 a. Draw the polar plot of $G(s)H(s) = \frac{100}{(s+2)(s+4)(s+8)}$. **(08 Marks)**

b. Sketch the Nyquist plot for a system with $G(s)H(s) = \frac{10(s+3)}{s(s-1)}$ comment on closed loop stability. **(08 Marks)**

Module-5

9 a. Explain the sampling process with the help of unit impulse train. **(06 Marks)**

b. What is diagonalization of a matrix explain with suitable example? **(05 Marks)**

c. Obtain the state model of the system represented by the differential equation.

$$\frac{d^3y(t)}{dt^3} + 6\frac{d^2y(t)}{dt^2} + 11\frac{dy(t)}{dt} + 10y(t) = 3u(t)$$ **(05 Marks)**

OR

10 a. Define the following terms:

i) State variable
ii) State space
iii) State trajectory. **(06 Marks)**

b. Obtain the state model of the given electrical system for the Fig.Q.10(b) **(06 Marks)**

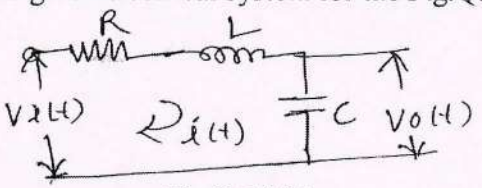

Fig.Q.10(b)

c. State the advantages and disadvantages of digital control system. **(04 Marks)**

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Eighth Semester B.E. Degree Examination, Jan./Feb. 2(

Network Security

Time: 3 hrs. Max

Note: ***Answer any FIVE full questions, selecting atleast TWO questions fro***

PART – A

1 a. Discuss the OSI Security Architecture focusing on security mechanism attacks.

b. With a neat diagram, discuss the function of Network Security model. List th designing security model.

2 a. Explain block cipher design principle.

b. With a neat diagram, explain the single round of DES encryption.

c. Discuss the evaluation criteria for Advanced Encryption Standard.

3 a. Discuss with illustrations i) Prime curves defined over Zp ii) Binary cur over GF (2^n) iii) Elliptic Curve Encryption and decryption.

b. Describe RSA Algorithm and discuss the security of RSA.

4 Write short notes on :

a. Authentication function b) Hash function

c. Authentication protocols d) Digital signature standard.

PART – B

5 a. Explain SSL protocol stack with a neat diagram and define the different par session and states.

b. Explain in detail the transactions supported by SET protocol.

6 a. Write short notes on :

i) Statistical anomaly detection ii) Rule based intrusion detection.

b. What are different techniques employed in choosing passwords? Compar merits.

7 a. Give the taxonomy of malicious programs. List the software threats and

b. Discuss the following : i) Email viruses ii) Digital Immune Systems.

8 a. What is a Firewall? Explain the various types of firewall configurations diagrams.