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10EC/TE61

# Sixth Semester B.E. Degree Examination, June/July 2016

## Digital Communication

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***





### PART – A

1 a. Explain sampling theorem of low pass signals and derive the interpolation formula. **(08 Marks)**

b. A low pass signal x(t) has spectrum X(f) given by,

$$X(f) = \begin{cases} 1 - \frac{|f|}{200}; & |f| < 200 \\ 0 & \text{Elsewhere} \end{cases}$$

Sketch the spectrum $X_\delta(f)$ for $|f| < 200$ Hz if x(t) is ideally sampled at $f_s = 300$ Hz. **(06 Marks)**

c. A band pass signal g(t) with a spectrum shown in Fig.Q1(c) is ideally sampled. Sketch the spectrum of sampled signal at $f_s = 25$ Hz and $f_s = 45$ Hz. Indicate if and how the signal can be recovered.

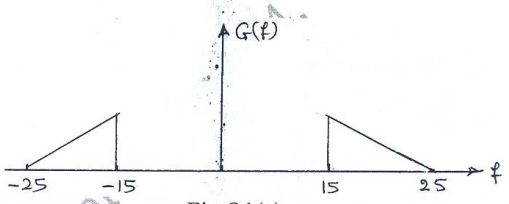


Fig.Q1(c) **(06 Marks)**

2 a. Derive the expression for signal to quantization noise ratio (SNR) and show that for uniform quantization, each bit in the codeword of a PCM contributes 6 dB to SNR. **(08 Marks)**

b. For a binary PCM signal, determine L if the compression parameter $\mu = 100$ and the minimum $[SNR]_0$ dB = 45 dB. Determine the $[SNR]_0$ dB with this value of L. **(06 Marks)**

c. With a neat block diagram and waveform, explain time division multiplexing. **(06 Marks)**

3 a. Explain the principles of delta modulator. With relevant figure and mathematical expressions, explain the functioning of DM transmitter and receiver. **(08 Marks)**

b. For a binary sequence 111000110101 draw the digital format waveforms corresponding to:
i) Bipolar NRZ waveform and ii) 8-ary signaling waveform. **(06 Marks)**

c. Derive an expression for power spectral density of bipolar NRZ format and plot the same with respect to frequency. **(06 Marks)**

4 a. What is correlative coding? Explain duo binary coding with and without precoding. **(08 Marks)**

b. The binary data 011100101 are applied to the input of a modified duo binary system:
i) Construct the modified duo binary coder output and corresponding receiver output without a precoder.
ii) Suppose that due to error in transmission, the level produced by the third digit is reduced to zero. Construct a new receiver output. **(07 Marks)**

c. With a neat block diagram, explain the concept of adaptive equalization. **(05 Marks)**

## PART – B

5 a. With neat block diagram, explain DPSK transmitter and receiver. Illustrate the generation of differentially encoded sequence for the binary input sequence 00100110011110. **(12 Marks)**

b. A binary data is transmitted over an AWGN channel using binary phase shift keying at the rate of 1 Mbps. It is desired to have average probability of error $P_e \leq 10^{-4}$. Noise power spectral density is $N_{0/2} = 10^{-12}$ W/Hz. Determine the average carrier power required at the receiver input, if the detector is of coherent type. Take erfc(3.5) = 0.00025. **(08 Marks)**

6 a. Write a note on Gram-Schmidt orthogonalization procedure. **(08 Marks)**

b. Consider the signal $s_1(t)$, $s_2(t)$, $s_3(t)$ and $s_4(t)$ as given below in Fig.Q6(b).

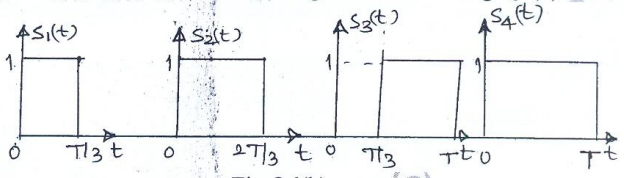


Fig.Q6(b)

Find an orthonormal basis for these set of signals using Gram-Schmidt orthogonalization procedure. **(12 Marks)**

7 a. Draw and explain the block diagram of correlation receiver. **(08 Marks)**

b. Show that the probability of bit error of a matched filter receiver is given by $P_e = \frac{1}{2}\text{erfc}\sqrt{\frac{E_b}{N_o}}$. **(12 Marks)**

8 a. What is spread spectrum technique? How are they classified? **(08 Marks)**

b. Explain properties of PN sequence. **(06 Marks)**

c. A slow FH/MFSK system has the following parameters:
The number of bits/MFSK symbol = 4
The number of MFSK symbols per hop = 6
Calculate processing gain of the system. **(06 Marks)**

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10EC/TE62

# Sixth Semester B.E. Degree Examination, June/July 2016
## Microprocessors

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***





### PART – A

1 a. With a neat diagram explain the internal architecture of 8086. **(08 Marks)**
b. Explain about segment registers and its advantages. **(06 Marks)**
c. Explain about instruction execution time dependency parameters. **(06 Marks)**

2 a. Explain the following instruction function with an example:
(i) LOOP (ii) IMUL (iii) XLAT (iv) AAM **(06 Marks)**
b. What is assembler directive? Explain the following assembler directives:
(i) ASSUME (ii) PUBLIC (iii) ALIGN **(08 Marks)**
c. Write an ALP to perform GCD of two 16-bit integers and comments. **(06 Marks)**

3 a. Write an ALP to perform reversing string along with flow chart. **(08 Marks)**
b. List out two differences between MACRO and PROCEDURE. **(06 Marks)**
c. List and briefly explain String instruction. **(06 Marks)**

4 a. What is interrupt? Explain about dedicated interrupts with respect to 8086. **(08 Marks)**
b. Briefly explain about hardware and software interrupt applications. **(06 Marks)**
c. What are the steps involve during the interrupt response. **(06 Marks)**

### PART – B

5 a. What is interfacing? Explain about m × n matrix keyboard interface diagram along with program and flow chart. **(14 Marks)**
b. Briefly explain about 8255 control word format. **(06 Marks)**

6 a. Explain about control register of 8087. **(06 Marks)**
b. Explain about various data types with respect to 8087. **(06 Marks)**
c. What is co-processor? Why it is called so? Give the significance of 8087 NDP. **(08 Marks)**

7 a. Explain maximum mode operation of 8086 with relevant block diagram. **(10 Marks)**
b. Write a short note on PCI and USB. **(10 Marks)**

8 a. Write the salient features of 80486. **(06 Marks)**
b. Briefly explain about 80386 special registers. **(10 Marks)**
c. Write a note on Pentium processor. **(04 Marks)**

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10EC63

# Sixth Semester B.E. Degree Examination, June/July 2016
## Microelectronic Circuits

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting any Three from Part–A and Two from Part–B.***





### PART – A

1 a. Derive the expression of $i_D - V_{DS}$ relationship for triode and saturation region of a NMOS transistor. **(10 Marks)**

b. For the MOSFET with $\frac{W}{L} = \frac{8\,\mu m}{0.8\,\mu m}$, calculate the values of $V_{GS}$ and $V_{DS}(min)$ needed to operate the transistor in the saturation region with a dc current $I_D$ = 100. Assume $K'_n$ =194 $\mu A/V^2$ and $V_t$ = 0.7 V. **(05 Marks)**

c. Write the expression for the relationship between $V_{SB}$ and $V_t$. Mention the effect of $V_{SB}$ on the channel. **(05 Marks)**

2 a. What are the benefits of short channel MOSFETs? **(06 Marks)**

b. Explain the operation of a MOSFET current mirror. **(06 Marks)**

c. Draw the circuit of a MOS current steering circuit and explain it. **(08 Marks)**

3 a. Explain CMOS implementation of the common source amplifier and also draw its i-v characteristic of the active load and transfer characteristic. **(10 Marks)**

b. Consider a common gate amplifier specified as follows :
$\frac{W}{L} = \frac{7.2\mu m}{0.36\mu m}$. $\mu_n C_{OX} = 387\,\mu A/V^2$, $\gamma_0 = 18$ KΩ, $I_D$ = 100 μA, $g_m = 1.25$ mA/V, $\chi = 0.2$, $R_S$ = 10 KΩ, $R_L$ = 100 KΩ, $C_{gs}$ = 20 fF, $C_{gd}$ = 5 fF and $C_L$ = 0. Find $A_{VO}$, $R_{in}$, $R_{out}$, $G_V$, $G_{is}$, $G_i$ and $f_H$. **(10 Marks)**

4 a. What is cascade amplifier? Mention the basic idea behind it. **(04 Marks)**

b. Derive the expression of voltage gain and open circuit voltage gain of a IC-source follower. Draw its small signal equivalent circuit model. **(08 Marks)**

c. Explain the operation of a MOS differential pair with common-mode input voltage. **(08 Marks)**

5 a. Explain the operation of a two-stage CMOS op-amp configuration. Mention its features. **(10 Marks)**

b. Illustrate the method of differential to single-ended conversion. **(07 Marks)**

c. What are the factors contribute to the dc offset voltage of the MOS differential pair? **(03 Marks)**

### PART – B

6 a. Discuss the properties of negative feedback in details. **(08 Marks)**

b. Explain the relationship between stability and pole location of an amplifier with effects. **(06 Marks)**

c. Draw the block diagram, representation of a series-shunt feedback amplifier and derive the expression of input resistance with feedback. **(06 Marks)**

7 a. Design a non-inverting amplifier with a gain of 2. At the maximum output voltage of 10 V and the current in the voltage divider is to be 10 μA. **(05 Marks)**

b. With a mathematical analysis and circuits, explain the temperature effects in Logarithmic amplifier are to be minimized. **(09 Marks)**

c. Draw the sample and hold circuit using op-amp and explain it. **(06 Marks)**

8 a. Define the following parameters of a logic circuit family and write the expressions :
i) Propagation delay.
ii) Robustness
iii) Delay-power product.
iv) Dynamic power dissipation. **(08 Marks)**

b. Implement :
i) $F = \overline{AB + CD}$ using the AND-OR-INVERT gate logic.
ii) $F = \overline{(A + B)(C + D)}$ using the OR-AND-INVERT gate logic. **(12 Marks)**

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10EC64

# Sixth Semester B.E. Degree Examination, June/July 2016

## Antennas and Propagation

Time: 3 hrs. Max. Marks: 100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***





### PART – A

1 a. Explain the following terms as related to antenna systems:
i) Beam area ii) Directivity iii) Power gain
iv) Effective aperture v) Radiation resistance **(10 Marks)**

b. Find the directivity of the power pattern given by $U = U_m \sin^2\theta \sin^3\phi$; $0 \le \theta \le \pi$; $0 \le \phi \le \pi$. **(05 Marks)**

c. An antenna has a field pattern given by $E(\theta) = \cos\theta \cos 2\theta$ for $0 \le \theta \le 90^\circ$. Find half power beam width (HPBW) and beam width between first nulls (BWFN). **(05 Marks)**

2 a. Derive an expression for array factor and relative field of linear array of 'n' isotropic point sources of equal magnitude and spacing. **(08 Marks)**

b. Complete the field patterns and find BWFN and HPBW for an array of 4 point sources spaced $\lambda/6$ distance apart. They have a phase difference of $\pi/3$ between adjacent elements. **(06 Marks)**

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

3 a. Derive the far field components of short dipole. **(07 Marks)**

b. For a short dipole of $\lambda/15$ long and loss resistance of $1\Omega$. Find:
i) Efficiency
ii) Radiation resistance
iii) Effective aperture **(06 Marks)**

c. Write short notes on:
i) V-antennas
ii) Folded dipole antennas
iii) Rhombic antenna **(07 Marks)**

4 a. Derive the far field expressions for small loop antenna. **(07 Marks)**

b. Explain patch or microstrip antennas with necessary sketch. **(06 Marks)**

c. With relevant sketches, explain the principle of Babinet's principle for complementary linear antennas. **(07 Marks)**

### PART – B

5 a. Explain the practical design considerations for the axial mode helical antennas. **(10 Marks)**

b. Write short notes on:
i) Yagi-Uda antenna
ii) Corner reflector antenna **(10 Marks)**

6 a. Explain the constructional details of Sleeve antenna and Turnstile antenna. **(08 Marks)**

b. Write short notes on:
   i) Embedded antennas
   ii) Ultra wideband antennas
   iii) Plasma antennas **(12 Marks)**

7 a. Derive an expression for wave tilt of surface wave. **(08 Marks)**

b. Explain duct propagation in detail. **(06 Marks)**

c. Estimate the wave tilt in degrees of the surface wave over an earth of 15 millimhos conductivity and relative permittivity of 10 at 1 MHz. **(06 Marks)**

8 a. Derive an expression for refractive index of an ionospheric propagation. **(06 Marks)**

b. A high frequency link is established for a range of 2000 km. If the reflection region of ionosphere is at a height of 200 km and has a critical frequency of 6 MHz, calculate maximum usable frequency (MUF). **(06 Marks)**

c. Define the following terms related to ionospheric propagation:
   i) MUF
   ii) Critical frequency
   iii) Virtual height
   iv) Skip distance **(08 Marks)**

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10EC65

# Sixth Semester B.E. Degree Examination, June/July 2016
## Operating Systems

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***





### PART – A

1 a. Define OS. What are the common tasks performed by an operating system? **(08 Marks)**

b. Explain briefly, the different classes of operating system, with primary concern and key concepts. **(08 Marks)**

c. What are the operations performed by Kernel when an interrupt occurs? **(04 Marks)**

2 a. Explain : (i) Monolithic OS and (ii) Microkernal OS
Specifying advantages and dis-advantages in each case. **(08 Marks)**

b. Define the following with respect to an operating system:
(i) Policies and mechanisms. (ii) Portability and Extensibility **(08 Marks)**

c. Briefly explain the concept of VMOS, with an example. **(04 Marks)**

3 a. Briefly explain four kinds of process interaction. **(06 Marks)**

b. With state transition diagram, explain the state transition for a process. **(06 Marks)**

c. What are the advantages of threads? Explain briefly Kernel-level and user-level threads, specifying advantages and disadvantages. **(08 Marks)**

4 a. Explain Kernel memory allocator methods. **(10 Marks)**

b. What are the key features in static and dynamic memory allocation? **(06 Marks)**

c. Explain briefly memory compaction with an example. **(04 Marks)**

### PART – B

5 a. With reference to virtual memory, explain the following:
(i) Demand paging (ii) Page replacement policies. **(10 Marks)**

b. Explain UNIX virtual memory. **(10 Marks)**

6 a. Explain file operations performed by processes. **(08 Marks)**

b. What are the facilities provided by file-system and IOCS? Write the layered architecture of the system. **(06 Marks)**

c. Explain (i) Sequential file organization (ii) Direct file access organization. **(06 Marks)**

7 a. Define Turn-around-time. Compare average Turn-Around-Time, for the following set of process for FCFS and SRN scheduling. **(08 Marks)**

| Process | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ |
|---|---|---|---|---|---|
| Arrival time | 0 | 2 | 3 | 5 | 9 |
| Service time | 3 | 3 | 2 | 5 | 3 |

b. Briefly explain process scheduling methods for real time applications. **(06 Marks)**

c. Explain briefly, scheduling in UNIX. **(06 Marks)**

8 a. How interprocess communication is achieved through mail-box? What are its advantages? **(08 Marks)**

b. Explain the following:
(i) Synchronous and asynchronous message passing.
(ii) Data – access synchronization.
(iii) Control synchronization. **(12 Marks)**

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10EC661

# Sixth Semester B.E. Degree Examination, June/July 2016
## Analog and Mixed Mode VLSI Design

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***





### PART – A

1 a. Explain sample and hold circuit with relevant diagram. Illustrate the errors associated with S/H circuit. **(08 Marks)**

b. Find resolution, input combination, value of 1 LSB, accuracy and full scale voltage for 4 bit, 8 bit and 16 bit DAC, assume $V_{REF} = 5V$. **(04 Marks)**

c. Draw the transfer curve for 3 bit ADC taking ideal condition. Also define the term differential non linearity with example. **(08 Marks)**

2 a. Find the valve output voltage of R-2R DAC if all $R_S = 1.1K\Omega$ and $2R_S = 2K\Omega$. What is maximum INL and DNL for the converter? Assume all the switches are ideal and $V_{REF} = 5V$. **(12 Marks)**

b. Draw the block diagram of cyclic DAC and write the expression for $V_{out}$, Also determine O/P voltage for digital input D = 101101, using 6 bit cyclic DAC. Assume $V_{REF} = 5V$. **(08 Marks)**

3 a. Explain the architecture and algorithm of the 2 step Hash ADC with example. **(08 Marks)**

b. Design 4 bit charge scaling DAC using split array. Assume $V_{REF} = 5V$ and $C = 0.5\ \mu F$. Draw the equivalent circuit for following digital input words D = 0001, 0010, 0100 and 1000. **(08 Marks)**

c. Describe the algorithm of 4 bit successive approximation ADC with its block diagram. **(04 Marks)**

4 a. Starting from block diagram of the voltage comparator explain the schematic design of the complete comparator design. **(10 Marks)**

b. Explain the various types of level shifting designs with relevant circuit diagrams. **(10 Marks)**

### PART – B

5 a. Explain how data converter signal to noise ratio is improved through averaging, use the relevant equations. **(10 Marks)**

b. With neat diagram explain high pass syn filter. **(06 Marks)**

c. Explain frequency sampling filters, with neat diagram. **(04 Marks)**

6 a. Explain how MOSFET can be used as capacitors. Explain the different types of MOS capacitors using relevant diagrams. **(10 Marks)**

b. Describe how MOSFET can be used as a switch and illustrate the switching resistance of MOSFET switch with relevant graph and examples. **(10 Marks)**

7 a. Design a delay element using pass transistor and hence design 3 bit synchronous up counter. **(10 Marks)**

b. Draw and explain complete mixed signal op-amp design. Also explain DC behaviour of the op-amp. **(10 Marks)**

8 Write short notes on following:

a. Mixed signal layout issues
b. Single slope integrated ADC
c. Pipe line DAC
d. Mismatch errors of resistor string DAC. **(20 Marks)**

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10EC662

# Sixth Semester B.E. Degree Examination, June/July 2016
## Satellite Communications

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***





### PART – A

1 a. Explain briefly about various satellite communication services. **(06 Marks)**

b. State and explain the Kepler's law of planetary motion with neat diagram necessary equations. **(10 Marks)**

c. Explain frequency band allocations as per ITU. **(04 Marks)**

2 a. What are the orbit perturbations that take place because of non spherical nature of earth? **(10 Marks)**

b. Explain in detail the earth eclipse of satellite and sun transit outage. **(06 Marks)**

c. What is side real time? **(04 Marks)**

3 a. Explain what is meant by EIRP? A satellite down link at 12GHz operates with a transmit power of 6W and an antenna gain of 48.2 db calculate the EIRP in dbW. **(06 Marks)**

b. Calculate horizontal, vertical and circular polarizations for a frequency of 12GHz. The rain attenuation is exceeded for 0.01% of the time in any year, for a point rain rate of 10mm/hr. The earth station attitude is 600 meters and the antenna elevation angle is 50°. The rain height is 3km and $a_h = 0.0188$ $b_h = 1.217$ $a_v = 0.168$ $b_v = 1.2$. **(10 Marks)**

c. List four different transmission losses in a satellite link. **(04 Marks)**

4 a. What is a satellite transponder? With a neat block diagram explain the overall frequency arrangement of typical C band communication satellite. **(10 Marks)**

b. What are different types of satellite antennas? Explain briefly all of them. **(06 Marks)**

c. What are the major sub systems of a communication satellite? Explain its functions. **(04 Marks)**

### PART – B

5 a. What is master antenna TV system? With the hap of a diagram describe an arrangement for MATV system. **(10 Marks)**

b. With a neat block diagram, Explain outdoor and the indoor unit for analog FM/TV. **(10 Marks)**

6 a. Describe briefly the modes of interference that can occur in satellite communication system. Distinguish between satellite and terrestrial mode of interference. **(10 Marks)**

b. The carrier to interference ratio at the ground receiving antenna is 23.3db. For the uplink [C/I] ratio is 27.53db. Find the overall ratio $[C/I]_{ant}$ for $[I/C]_U = 0.001766$ and $[I/C]_D = 0.004436$. **(06 Marks)**

c. Explain briefly different types of satellite access? **(04 Marks)**

7 a. Give the applications of Radarsat. Explain a "Dawn to Dusk" orbit. **(08 Marks)**

b. Explain frequency and polarization of direct broadcast satellite service. **(08 Marks)**

c. Explain bit rates of digital television. **(04 Marks)**

8 a. Calculate the bit rates that can be carried in the 24MHz channels using QPSK, allowing a roll off factor of 0.2. **(06 Marks)**

b. Describe the main features iridium system in detail with diagram and application. **(10 Marks)**

c. What are the applications of VSAT? **(04 Marks)**

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10TE63

# Sixth Semester B.E. Degree Examination, June/July 2016
## Antennas and Propagation

Time: 3 hrs. Max. Marks:100

**Note: 1)** ***Answer FIVE full questions, selecting at least TWO questions from each part.***
**2)** ***Assume any missing data suitably.***





### PART – A

1 a. Define the term antenna aperature. Derive the equation for directivity in terms of aperature. **(06 Marks)**

b. Show that the directivity of a short dipole is 50% greater than the directivity of an isotropic antenna. **(06 Marks)**

c. A lossless resonant $\frac{\lambda}{2}$ dipole antenna having an input impedance of 73 Ω is to be connected to a transmission line having characteristics impedance of 50 Ω. The radiation intensity pattern of the antenna is given by, $U = U_m \sin^3\theta$. Find the overall gain of the antenna. **(08 Marks)**

2 a. State and prove the power theorem. **(05 Marks)**

b. Derive an expression and draw the field pattern for an array of two isotropic point sources of same amplitude and opposite phase. **(07 Marks)**

c. Obtain the field pattern for a linear uniform array of 6 isotropic point sources spaced $\frac{\lambda}{2}$ apart. The power is applied with equal amplitude and in-phase. Also find maxima and sidelobe levels for the pattern and calculate FNBW and HPBW. **(08 Marks)**

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

b. A thin linear short dipole antenna is $\frac{\lambda}{12}$ long. Find the radiation resistance and efficiency of the dipole for loss resistance of 1.2 Ω. **(04 Marks)**

c. Explain following antennas with relevant diagrams: (i) Folded dipole antennas (ii) Long-wire antennas. **(08 Marks)**

4 a. Considering general case derive the far field equations for loop antenna. **(08 Marks)**

b. Explain Babinet's principle with illustration. **(04 Marks)**

c. Derive the equation for impedance of a slot antenna in terms of the impedance of the complementary dipole antenna. **(08 Marks)**

### PART – B

5 a. With the help of neat diagrams, explain : (i) Sleeve antenna and (ii) Turnstile antenna. **(08 Marks)**

b. Explain features and practical design considerations of the helical antenna. **(08 Marks)**

c. Design Yagi-Uda antenna of six elements to provide a gain of 12 dBi if the operating frequency is 200 MHz. **(04 Marks)**

6 a. Explain : (i) Ultra wide band antenna.
(ii) Lens antenna. **(10 Marks)**

b. With the help of neat diagrams explain, (i) Parabolic reflectors (ii) Antennas for ground penetrating RADAR. **(10 Marks)**

7 a. Derive an expression for field intensity in the case of space wave propagation. **(10 Marks)**

b. Explain duct propagation. **(05 Marks)**

c. Determine :
(i) the radio horizon distance for a transmitting antenna height of 300 feet.
(ii) the radio horizon distance of a receiving antenna with a height of 100 feet.
(iii) the maximum range of space wave communication for the above antenna heights. **(05 Marks)**

8 a. Explain the mechanism of ionospheric wave propagation. Also derive an expression for the refractive index of ionosphere. **(10 Marks)**

b. Define the terms: i) Critical frequency, ii) Skip distance for ionosphere with neat diagrams. **(05 Marks)**

c. Calculate the value of frequency at which the electromagnetic wave should be propagated in the D region. It is given that refractive index $\mu = 0.5$ and electron density $N = 10^{12}$ electrons/$m^3$. **(05 Marks)**

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10TE64

# Sixth Semester B.E. Degree Examination, June/July 2016

## Microwaves and Radar

Time: 3 hrs. Max. Marks:100

**Note: 1.** ***Answer FIVE full questions, selecting at least TWO questions from each part.***
**2.** ***Use of Smith chart is permitted.***





### PART – A

1 a. Define reflection coefficient. Derive the equation for reflection coefficient at the load end and at a distance 'd' from load end, starting from equation for Zℓ. **(10 Marks)**

b. A load of 73 – j80 ohms is required to be latched to 50 ohm coaxial line having operating wavelength $\lambda = 30$ cm, using a short circuited shunt stub. Determine the position and length of the stub. **(10 Marks)**

2 a. Derive the relevant equations for the propagation of TE waves in a rectangular waveguide and explain how dominant mode is obtained. **(12 Marks)**

b. What is a directional coupler? Explain the working of two hole directional coupler. **(08 Marks)**

3 a. Explain the modes of operation for Gunn diode. **(10 Marks)**

b. Explain parametric up converter with necessary equations for gain, noise figure and band width. **(10 Marks)**

4 a. What is a reciprocal network? For a reciprocal microwave N port network, prove that the admittance and impedance matrices are symmetrical. **(07 Marks)**

b. State and prove the following properties of S-parameters:
i) Symmetrical property for reciprocal network.
ii) Unitary property for a lossless junction. **(08 Marks)**

c. The S-parameters of a two network are given by $S_{11} = 0.2\angle 0°$, $S_{22} = 0.1\angle 0°$, $S_{12} = 0.6\angle 90°$ and $S_{21} = 0.6\angle 90°$. Is the network reciprocal? Lossless? **(05 Marks)**

### PART – B

5 a. Explain construction and working of a precision rotary type phase shifter, with neat diagram. **(08 Marks)**

b. In a H-plane T junction compute the power delivered to the loads 40 ohms and 60 ohms connected across arms 1 and 2 when 10 mW power is delivered to the matched port 3. (Assume $Z_0 = 50$ ohms). **(07 Marks)**

c. Explain working of Magic Tee as balanced microwave mixer. **(05 Marks)**

6 a. Explain the operation of micro strip line with its structure and Quasi TEM mode field distribution. **(07 Marks)**

b. With a neat diagram, explain the operation of parallel strip line. And also write the expressions for distributed parameters of parallel strip line; characteristic impedance and attenuation of the same. **(07 Marks)**

c. A certain shielded strip line has w = 63.5 mm, t = 35 mm and d = 180 mm. It has a permittivity of 2.56. Compute its characteristic impedance, K factor and Fringe capacitance. **(06 Marks)**

7 a. Derive the radar range equation. Discuss the effects of each parameter on the maximum detection range of the radar. **(08 Marks)**

b. Explain Doppler frequency shift for moving targets. **(07 Marks)**

c. A marine radar operating at 10 GHz has a maximum range of 50 km. With an antenna gain of 4000. The transmitter has a power of 250 KW and a minimum detectable signal of $10^{-11}$ Watts. Determine the cross section of the target the radar can sight. **(05 Marks)**

8 a. Explain the principle and working of moving target indicator radar, with the help of a block diagram. **(10 Marks)**

b. Write brief notes on:

i) Blind speed

ii) Delay line canceller **(10 Marks)**

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10TE65

# Sixth Semester B.E. Degree Examination, June/July 2016
## Information Theory and Coding

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***





### PART – A

1 a. Discuss extremal property of entropy with examples. **(05 Marks)**

b. Suppose that $s_1$ and $s_2$ are two memory sources with probabilities $p_1, p_2, \ldots p_n$ for source $s_1$ and $q_1, q_2, \ldots q_n$ for source $s_2$. Show that the entropy of source $s_1$.

$$H(s_1) \le \sum_{k=1}^{n} P_k \log \frac{1}{q_k}.$$ **(05 Marks)**

c. Consider the state diagram of the Markov source of Fig.Q.1(c).
i) Compute the state probabilities; ii) Find the entropy of each state; iii) Find the entropy of the source. **(10 Marks)**

2 a. Construct binary code for the following source using Shannon's binary encoding procedure $S = \{s_1, s_2, s_3, s_4, s_5\}$ $P = \{0.4, 0.25, 0.15, 0.12, 0.08\}$. **(08 Marks)**

b. A source produces 5 symbols $s_1$, $s_2$, $s_3$, $s_4$ and $s_5$ with respective probabilities of 0.1, 0.3, 0.4, 0.12 and 0.08.
i) Construct Huffman binary code.
ii) Determine efficiency and redundancy of the code.
iii) Draw code tree. **(06 Marks)**

c. Discuss Shanon-Fano encoding algorithm with an example. **(06 Marks)**

3 a. Define binary erasure channel and obtain an expression for its channel capacity. **(06 Marks)**

b. Find the mutual information and the channel capacity of the channel shown in Fig.Q.3(b). **(06 Marks)**

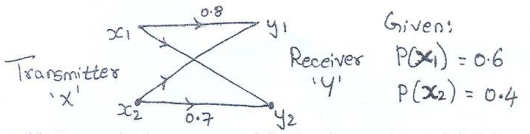


Fig.Q.3(b)

c. Define: i) Priori entropy; ii) Posteriori entropy; iii) Equivocation; iv) Mutual information. **(08 Marks)**

4 a. State and prove Shanon-Hartley law. Derive an expression for upper limit on channel capacity as bandwidth tends to infinity. **(08 Marks)**

b. Consider a continuous random variable Y defined by Y = X + N where X and N are statistically independent. Show that the conditional differential entropy of Y, Given X is $H(y/x) = H(N)$ where H(N) is the differential entropy of N. **(06 Marks)**

c. Alpha numeric data are entered into a computer from a remote terminal through a Voice-grade telephone channel. The channel has a band width of 3.4 kHz and output signal to noise ratio of 20dB. The terminal has a total of 128 symbols. Assume that the symbols are equiprobable and the successive transmissions are statistically independent.
i) Calculate channel capacity
ii) Find the average information content per character.
iii) Calculate the maximum symbol rate for which error-free transmission over the channel is possible. **(06 Marks)**

## PART – B

5 a. What is error control coding? What are the different error controlling methods? **(05 Marks)**

b. Find the generator matrix G and parity check matrix H for a linear block code with minimum distance three and a message block size of eight bits. **(05 Marks)**

c. The generator matrix of a linear block code is given by $[G] = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 \end{bmatrix}$.

i) Find all the possible valid code-vectors; ii) Find parity check matrix; iii) Find minimum distance; iv) Draw encoding circuit; v) Draw syndrome calculation circuit. **(10 Marks)**

6 a. Draw the general block diagram of syndrome calculation circuit for cyclic codes and explain its operation. **(06 Marks)**

b. A linear Hamming code is described by a generator polynomial $g(D) = 1 + D + D^3$.

i) Determine the generator matrix G and parity check matrix H.

ii) Design encoder circuit. **(06 Marks)**

c. Consider the (15, 11) cyclic code generated by $g(x) = 1 + x + x^4$.

i) Draw the feedback register encoding circuit for this cyclic code.

ii) Illustrate the encoding procedure with the vector 01101001011 by listing the states of the register with each input.

iii) Verify the code polynomial by using the division method. **(08 Marks)**

7 a. Discuss Reed-Solomon (RS) codes, and Golay codes. **(08 Marks)**

b. Determine the parameters of q-ary RS code over GF(16) for a $d_{min} = 9$. Also find the total number of code words in the code and also the nearest neighbours for any code-word at a distance of $d_{min} = 9$. **(09 Marks)**

c. Consider a (15, 9) cyclic code generated by $g(x) = 1 + x^3 + x^4 + x^5 + x^6$. This code has burst error correcting ability b = 3. Find the burst-error correcting efficiency of this code. **(03 Marks)**

8 a. Consider the (3, 1, 2) convolution code with $g^{(1)} = (1\ 1\ 0)$ $g^{(2)} = (1\ 0\ 1)$ and $g^{(3)} = 1\ 1\ 1$.

i) Draw the encoder block diagram.

ii) Find the generator matrix.

iii) Find the codeword corresponding to the information sequence (1 1 1 0 1) using time domain and transform domain approach. **(12 Marks)**

b. For the convolution encoder shown in Fig.Q.8(b):

i) Find the impulse response and hence calculate the output produced by the information sequence 10111.

ii) Write the generator polynomial of the encoder. **(08 Marks)**

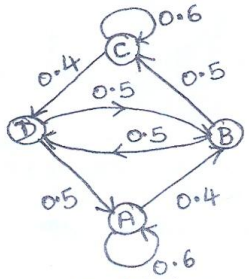

Fig.Q.1(c)

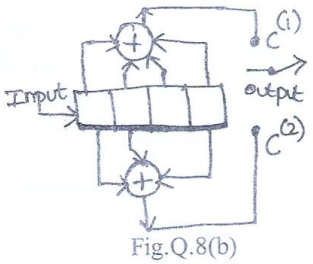

Fig.Q.8(b)

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10TE661

# Sixth Semester B.E. Degree Examination, June/July 2016
## Programming in C++

Time: 3 hrs. Max. Marks:100

**Note:** *Answer any FIVE full questions, selecting atleast TWO questions from each part.*





### PART – A

1 a. What are the characteristics of object oriented programming language? Explain any two of them. **(08 Marks)**

b. Explain with an example program, how dynamic memory allocation is performed, with the help of new and delete operators. **(06 Marks)**

c. What are preprocessor directives? Explain with examples. **(06 Marks)**

2 a. Explain with appropriate examples the following :
i) bool data type
ii) Reference variable
iii) Enumerated data type. **(06 Marks)**

b. What are variables? What are the two values associated with variables? List out rules for naming variables. **(06 Marks)**

c. What are the basic operations performed on string. Write a program in C++ to find the length of the string. **(08 Marks)**

3 a. Explain bitset operators used in C++. **(08 Marks)**

b. Write a program in C++, to find if the given number is prime or not. **(06 Marks)**

c. Explain goto, break and continue statements with an examples. **(06 Marks)**

4 a. What are functions? Mention its advantages in programming. **(05 Marks)**

b. Write a C++ program to find larges element in an array, using a function. **(07 Marks)**

c. Define recursion. Write a C++ recursion function to find GCD of 2 integers. **(08 Marks)**

### PART – B

5 a. What is an exception? Why is exception handling needed? Name the different types of exceptions. **(10 Marks)**

b. With an example, explain briefly try, throw and catch mechanism in C++. **(10 Marks)**

6 a. Define class and object. With the help of general syntax, describe a class, class members, class object arrays and vectors. **(10 Marks)**

b. Explain parameterized constructors. Develop a C++ program to implement parameterized constructors. **(10 Marks)**

7 a. What is operator overloading? Write a C++ program to add 2 complex numbers by overloading operator '+'. **(10 Marks)**

b. Write a C++ program to overload the ++ and – – operator. **(10 Marks)**

8 a. Explain single and multilevel inheritance with examples. **(10 Marks)**

b. Explain the following :
i) Base class and derived class
ii) Local, static and global variables. **(10 Marks)**

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10TE664

# Sixth Semester B.E. Degree Examination, June/July 2016
## Adaptive Signal Processing

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer FIVE full questions, selecting at least TWO questions from each part.***





### PART – A

1 a. Define adaptation system. Mention some of the characteristics of adaptive system. **(04 Marks)**

b. Explain principle of open-loop and closed-loop adaptation. Mention different classes of closed loop adaptation with examples. **(06 Marks)**

c. For a multiple input adaptive linear combiner with desired response, derive the expression for mean square error, its gradient and minimum mean square error. **(10 Marks)**

2 a. For the system shown Fig.Q.2(a) with two weights, the input and desired signals are sampled at the same frequency N samples per cycle. Obtain an expression for mean square error. For N = 10, find the optimum weight vector. **(10 Marks)**

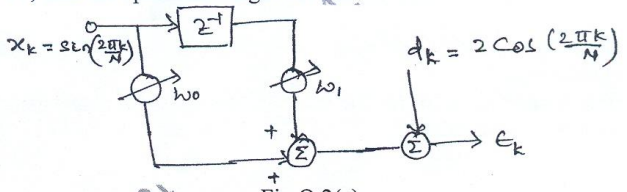


Fig.Q.2(a)

b. For the system shown in Fig.Q.2(b) with 'S' open.
$E[x_k^2] = 1$, $E[x_k x_{k-1}] = 0.5$, $E[d_k^2] = 4$, $E[d_k x_k] = -1$, $E[d_k x_{k-1}] = 1$.
Derive an expression for performance function and make a plot of the same. **(10 Marks)**

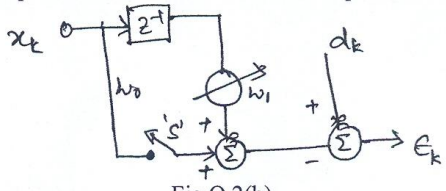


Fig.Q.2(b)

3 a. Show that Eigenvectors corresponding to distinct Eigenvalues of R are mutually orthogonal, and also prove that Eigen values are all real and greater than equal to zero. **(10 Marks)**

b. Given $R = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$; $P = \begin{bmatrix} 7 \\ 8 \end{bmatrix}$; $E[d_k^2] = 42$. Find error surface, Eigen values and Eigenvectors. **(10 Marks)**

4 a. Derive a weight adjustment formula to apply Newton's method to the performance surface given as $\xi = 1 - \frac{1}{26}[(1-w^2)(4+3w)^2 + 1]$. **(10 Marks)**

b. Derive weight adjustment formula for steepest descent algorithm. **(10 Marks)**

## PART – B

5 a. Define excess MSE. Obtain an expression for excess MSE in case of Newton's method. **(10 Marks)**

b. Derive a general expression for perturbation P in mean square error with mean square error with multiple weights. **(10 Marks)**

6 a. For a single input adaptive linear combiner with two weights for $x_k = \sin\left(\frac{2\pi k}{N}\right) + r_k$, $d_k = 2\cos\left(\frac{2\pi k}{N}\right)$, $E[r_k^2] = \phi$. Find the mean square error expression and optimum weight for N = 16 and $\phi = 0.01$. **(12 Marks)**

b. Make a performance comparision between steepest descent and LMS algorithm. **(08 Marks)**

7 a. Explain how adaptive modeling can be achieved in
i) Single input single output plant
ii) Multiple input multiple output plant. **(10 Marks)**

b. Explain adaptive modeling of
i) Multipath communication system
ii) Geophysical exploration. **(10 Marks)**

8 a. Show that power inversion happens with an adaptive noise canceller with signal components. **(10 Marks)**

b. Obtain an expression for the transfer function of a notch filter realized by using adaptive interference canceller. **(10 Marks)**

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