USN | 1 | K | S | 1 | 3 | E | C | 0 | 5 | 7 |

10EC/TE61

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. State and prove sampling theorem for low pass signals assuming train of impulses for sampling. **(08 Marks)**

b. Explain the principle of quadrature sampling of band pass signals. **(06 Marks)**

c. The signal $g(t) = 4\cos(4\pi t)(\cos 400\pi t)$ is sampled at the rate of 500 samples per second:
i) Determine the spectrum of the resulting sampled signal.
ii) What is Nyquist rate for g(t)?
iii) What is cut off frequency of ideal reconstruction filter? **(06 Marks)**

2 a. With a suitable block diagram, explain the functioning of PCM system. **(10 Marks)**

b. Three independent message source of bandwidths 1 kHz, 1 kHz and 2 kHz respectively are to be transmitted using TDM scheme. Determine
i) The commutator segment arrangement.
ii) The speed of commutator if each signal is sampled at its Nyquist rate.
iii) Minimum transmission bandwidth. **(05 Marks)**

c. The bandwidth of signal input to PCM is restricted to 4 kHz. The input varies from −3.8 to 3.8 V and has average power of 30 mW. The required signal to noise ratio is 20 dB. The modulator produces binary output. Assume uniform quantization
i) Calculate the number of bits required per sample.
ii) Output of 30 such PCM coders are time multiplexed. What is the minimum required transmission bandwidth for multiplexed signal? **(05 Marks)**

3 a. With neat diagram, explain the operation of DPCM. **(06 Marks)**

b. Derive the expression for output signal to quantization noise ratio of a delta modulator. **(10 Marks)**

c. Assume a speech signal with a minimum frequency of 3.4 kHz and a maximum amplitude of 1 V. The speech signal is applied to a delta modulator with its bit rate at 25 kbps. Discuss the choise of an appropriate step size for a delta modulator. **(04 Marks)**

4 a. Describe Nyquist criteria for distortionless baseband transmission. **(06 Marks)**

b. A binary data sequence is 10110100. Sketch the waveforms for the following formats:
(i) Unipolar NRZ (ii) Unipolar RZ (iii) Polar NRZ (iv) Polar RZ
(v) Manchester coding (vi) Bipolar NRZ. **(06 Marks)**

c. With a neat structure explain concept of adaptive equalization process. **(08 Marks)**

PART – B

5 a. Show that probability of symbol error for frequency shift keying is $P_e = \frac{1}{2}\text{erfc}\left(\sqrt{\frac{\varepsilon_b}{2N_0}}\right)$. **(12 Marks)**

b. With a block diagram of QPSK transmitter and receiver explain generation and demodulation of a QPSK wave. **(08 Marks)**

6 a. Explain the importance of geometric interpretation of signals. Illustrate the geometric interpretation of signals for the case of 2-dimensional signal space with 3 signals. **(08 Marks)**

b. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are as shown. Apply Gram-Schmidt procedure to obtain an orthonormal basis for the signals. Express the signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ in terms of orthonormal basis functions. Also give the signal constellation diagram. **(12 Marks)**

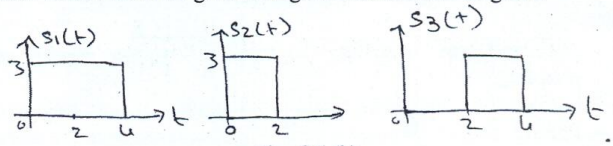

Fig. Q6 (b)

7 a. Derive the expression for maximum signal to noise power ratio of a matched filter. **(12 Marks)**

b. Explain the working of a correlation receiver with block diagram of a detector and vector receiver. **(08 Marks)**

8 a. Explain direct sequence spread spectrum technique with block diagram. **(08 Marks)**

b. Differentiate slow frequency hopping and fast frequency hopping. **(05 Marks)**

c. A 3-stage shift register with a linear feedback generates the sequence : 01011100101110

i) Determine the period of the given infinite sequence.

ii) Verify the three properties of the PN sequence for the given sequence. **(07 Marks)**

* * * * *

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

10EC/TE62

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Microprocessor

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 architecture of 8086 microprocessor with a neat block diagram. **(10 Marks)**

b. Define addressing modes of 8086 and identify the addressing modes of the following instructions: i) add ax, [si] ii) mov al, [1000] iii) mov [bx + si + 06], bl iv) mov bx, [bp + 50] **(10 Marks)**

2 a. Discuss the functions of following instructions:
i) xlat ii) aam iii) das iv) imul bx
v) lds bx, [1234h] **(10 Marks)**

b. Write an ALP to multiply two-16 bit packed BCD numbers. **(06 Marks)**

c. Define the following assembler directives:
i) ALIGN ii) EVEN iii) ENDS iv) LOCAL **(04 Marks)**

3 a. Describe the following string instructions :
i) repe movsb ii) cmpsb iii) scasb iv) lodsb **(08 Marks)**

b. Write an ALP to scan for a character in a string and replace by another character. Use assembler directives. **(08 Marks)**

c. Write a program to convert binary byte to ASCII equivalent. **(04 Marks)**

4 a. Define an interrupt. Explain 8086 interupts and response mechanism. **(08 Marks)**

b. Write a macro for the following cases:
i) Read a character from keyboard without echo.
ii) Display a message on the CRT monitor.
iii) Display an integer on CRT monitor. **(06 Marks)**

c. Write a subroutine to print a string on printer. Call this subroutine from a main program to print two message strings. **(06 Marks)**

PART – B

5 a. Interface 4×4 keyboard to 8086 microprocessor using 8255 PPI. Write the necessary circuit diagram and program. **(10 Marks)**

b. Write an ALP to interface seven segment display to 8086 and demonstrate the display as flashing display. Write the necessary circuit diagram. **(10 Marks)**

6 a. Write the control word format of 8087 and define various fields. **(04 Marks)**

b. What are the functions of following 8087 instructions? Explain.
(i) FENI (ii) FCOMP (iii) FSTENV (iv) FLDL2E
(v) FLDZ **(10 Marks)**

c. Write 8087 ALP to compute the volume of the sphere. **(06 Marks)**

7 a. With a neat block diagram, explain the maximum mode operation of 8086. **(10 Marks)**

b. What are the characteristics of PCI and USB interface? **(06 Marks)**

c. Show an interface of printer to a 8086 microprocessor. Define the signals of importance. **(04 Marks)**

8 Write short notes for the following:

a. Pentium microprocessor. **(08 Marks)**

b. Special registers of 80386. **(06 Marks)**

c. Memory structure of 80386. **(06 Marks)**

* * * * *

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

10EC63

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Micro Electronic Circuits

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the following parameters with respect to MOSFET:
i) Threshold voltage; ii) Overdrive voltage. **(05 Marks)**

b. Explain the breakdown effect occurs in MOSFET. **(05 Marks)**

c. Draw the biasing circuit using a drain to gate feedback resistor and explain it. **(05 Marks)**

d. For the circuit shown in Fig.Q.1(d), find the values of R and V_D to obtain a current I_D of 80μA. Let the NMOS transistor have $V_t = 0.6V$, $\mu_n C_{ox} = 200\ \mu A/V^2$, L = 0.8 μm and W = 4 μm. Assume $\lambda = 0$. **(05 Marks)**

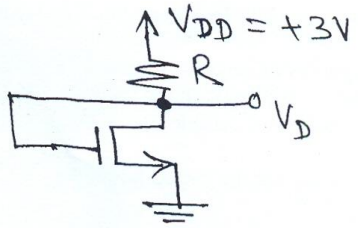

Fig.Q.1(d)

2 a. What are the disadvantages due to short-channel effects? **(05 Marks)**

b. The high frequency response of an amplifier is characterized by the TF $F_H(s) = \dfrac{1-\frac{s}{10^5}}{\left(1+\frac{s}{10^4}\right)\left(1+\frac{s}{4\times10^4}\right)}$. Determine the 3-dB frequency. **(05 Marks)**

c. What is current steering? Mention its advantages. **(05 Marks)**

d. Draw the circuit of basic MOSFET current source and explain it. **(05 Marks)**

3 a. Draw the circuit and small signal equivalent circuit of common source amplifier with active load and explain it. **(06 Marks)**

b. What is cascade amplifier and mention the basic idea behind the cascade amplifier? **(06 Marks)**

c. Draw the circuit of double cascading and explain it. **(08 Marks)**

4 a. Draw the transistor pairing circuits and mention the advantages of each pair. **(06 Marks)**

b. Draw the circuit of cascade MOS current mirror and explain it. **(06 Marks)**

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

PART – B

5 a. The differential amplifier shown in Fig.Q.5(a) uses transistors with $\beta = 100$. Evaluate:
   i) Input differential resistance (R_{id}).
   ii) Overall differential voltage gain V_o/V_{sig} (neglect the effect of V_o).
   iii) CMRR in dB. (Assume $A_{cm} = 5 \times 10^{-4}$).
   iv) Input common mode resistance (assuming that the early voltage $V_A = 100V$. **(10 Marks)**

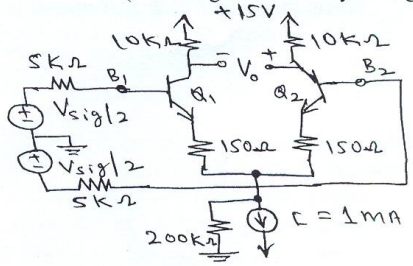

Fig.Q.5(a)

   b. Draw the two-stage CMOS Op-Amp circuit and explain it. **(10 Marks)**

6 a. Explain the properties of negative feedback. **(10 Marks)**
   b. Explain the effect of feedback on the amplifier stability and pole location. **(07 Marks)**
   c. What are the properties of current amplifier? **(03 Marks)**

7 a. Derive the expression for the closed loop gain V_o/V_{in} of the circuit shown in Fig.Q.7(a). **(08 Marks)**

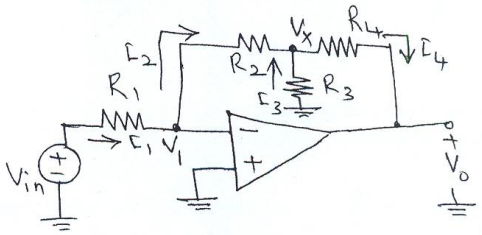

Fig.Q.7(a)

   b. With the help of mathematical analysis, explain how to minimize the temperature effect in logarithmic amplifier. **(10 Marks)**
   c. What are DC imperfections? **(02 Marks)**

8 a. Obtain the PUN from the PDN and vice versa for the following expressions:
   i) $Y = \overline{A(B + CD)}$ ii) $Y = \overline{\overline{A}(B + AC)}$ **(12 Marks)**
   b. Define the following parameters with respect to CMOS:
   i) Propagation delay
   ii) Robustness
   iii) Delay power product
   iv) Dynamic power dissipation. **(08 Marks)**

* * * * *

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

10EC64

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Draw diagram wherever necessary.

PART – A

1 a. Obtain relation between directivity and beam width and also write equation for estimating directivity. **(05 Marks)**

b. A parabolic reflector antenna is circular in cross – section with a diameter 1.22 m. If the maximum effective aperture equals 55% of the physical aperture, calculate gain of antenna in dB at 20 GHz. **(07 Marks)**

c. Show that the maximum effective aperture of a $\lambda/2$ dipole is $\frac{30}{73\pi}\lambda^2$ and also obtain radiation resistance of $\lambda/2$ dipole is 73Ω. **(08 Marks)**

2 a. Derive Hansen–Woodyard condition for 'n' element end fire array for enhancing directivity. **(08 Marks)**

b. A linear uniform array of isotropic antennas satisfy the following parameter, obtain the field pattern and find BWFN and HPBW $\eta = 4$; $\delta = 0$; $d = \lambda/2$. **(07 Marks)**

c. Explain in detail pattern multiplication method in array synthesis. **(05 Marks)**

3 a. Derive an expression for power radiated by current element and radiation resistance of short dipole. **(09 Marks)**

b. Obtain an expression for field of dipole in general ($\ell \geq \lambda/4$) for thin linear antenna. **(06 Marks)**

c. A half wave dipole in free space is radiating with a current of 1A(rms) at the antenna terminals. Find the angle θ for maximum field strength and determine the field strength and power density at a point 1 mile from the antenna at the corresponding angle. **(05 Marks)**

4 a. Obtain expression for radiation resistance of loop antenna. **(08 Marks)**

b. The multiturn rod antenna of a broadcast receiver has 10 turns of 1 mm diameter copper wire wound on a ferrite rod 1 cm in diameter and 10cm long. For the ferrite rod $\mu_r = \mu_r' - \mu_r'' = 250 - j2.5$. Take the effective relative permittivity of ferrite rod $\mu_{er} = 50$. At 1 MHz find : i) the radiation efficiency ii) the Q factor iii) Half power bandwidth. **(06 Marks)**

c. The diameter of a circular loop antenna is 0.04 λ. How many turns of antenna will give a radiation resistance of 36 Ω? **(06 Marks)**

PART – B

5 a. Explain the radiation mechanism of microstrip patch antenna and its characteristics. **(06 Marks)**

b. Determine length ρ of the horn, H – plane aperture and flare angles θ_E and θ_H in (E and H plane) of a pyramidal horn for which E – plane aperture is 10λ. The horn is fed with a rectangular waveguide with TE_{10} mode. Let $\delta = 0.2\ \lambda$ in E plane and $0.375\ \lambda$ in H plane. Calculate beam width and directivity. **(08 Marks)**

c. Explain the basic concepts of reflector antenna and concepts involved in plane and corner reflector. **(06 Marks)**

6 a. Explain with suitable sketches perpendicular mode of radiation in helical antenna and obtain an expression for axial ratio and pitch angle. **(05 Marks)**

b. Write a short note on :
   i) Sleeve antenna
   ii) plasma antenna
   iii) embedded antennas. **(09 Marks)**

c. Explain in brief antenna for satellite communication. What are different design consideration for the same? **(06 Marks)**

7 a. Derive relation between radius of curvature of earth and the change in refractive index with height. **(08 Marks)**

b. Obtain an expression for field strength at receiving antenna for the wave propagation in free space. **(07 Marks)**

c. If a transmitting aerial is located at the top of a tower 200 m above the surface of the earth. Determine the maximum distance at which an air craft flying at an altitude 3000m will be able to receive signal form the transmitter. Assume that only LOS propagation involved. If the transmitting aerial has a power gain of 13 dB in direction of aircraft and the power radiated is 400 watts, determine the electric field strength of signal at the air craft. Assume an earth of 6350 kms radius. **(05 Marks)**

8 a. Explain what will happen if a radio wave with a frequency greater than the critical frequency is propagated to the ionosphere? Will it return back? Obtain the condition such that such a wave return back to the earth. **(07 Marks)**

b. Define the following :
   i) optimum working frequency
   ii) maximum usable frequency. **(06 Marks)**

c. In ionospheric propagation, consider that the reflection takes place at height of 300 km and that the maximum density in ionosphere corresponds to refractive index of 0.8 at 15 MHz frequency. Determine ground range for curved earth for which given frequency is MUF. **(07 Marks)**

* * * * *

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

10EC65

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Operating Systems

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Mention the different classes of operating systems. What is the prime concern addressed in each class? **(04 Marks)**

b. Explain the functions of multiprogramming supervisor in detail. Also give the architectural support. **(10 Marks)**

c. Differentiate between Hard Real time Systems vs. Soft Real time Systems. **(06 Marks)**

2 a. List the features operating system fails to handle when installed in a different machine. **(02 Marks)**

b. Explain (i) System generation (ii) Configuration tools (iii) Dynamic configuration of supervisor. **(12 Marks)**

c. Explain monolithic structure of O.S. Give its drawbacks. **(06 Marks)**

3 a. Explain four kinds of process interaction. **(04 Marks)**

b. What are Event Control Blocks (ECBs)? Explain the fields contained in ECBs. Also explain event handling actions of kernel with diagram. **(08 Marks)**

c. What is a process? Explain with a neat diagram process states and state transitions in Unix. **(08 Marks)**

4 a. Give the difference between static and dynamic memory allocation. **(04 Marks)**

b. Explain with diagram merging free areas using bounding tags. **(08 Marks)**

c. Explain slab allocator used in solaris as one of kernel memory allocator. **(08 Marks)**

PART – B

5 a. What is demand paging? With a diagram explain the following with respect to demand paging: (i) Page faults (ii) Page in and page out operations (iii) Page replacement. **(12 Marks)**

b. Discuss memory mapping of a file by a process with diagram. Give its advantages. **(08 Marks)**

6 a. Discuss the various attributes of a file. **(04 Marks)**

b. List the various operations carried out on directories. Explain mounting of a file system. **(08 Marks)**

c. Describe file system actions at open, close and at file operations. **(08 Marks)**

7 a. With a neat schematic diagram, explain the concept of scheduling. **(05 Marks)**

b. Discuss the following non-preemptive scheduling policies:
(i) FCFS scheduling (ii) Shortest request next (SRN) (iii) Highest Response ratio next **(15 Marks)**

8 a. Explain Interprocess Message Control Block (IMCB). **(04 Marks)**

b. Write a note on mailboxes. Give the advantages of mailboxes. **(07 Marks)**

c. Explain the three interprocess communication features supported by unix. **(09 Marks)**

* * * * *

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

10EC661

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Analog & 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. Define analog signal and digital discrete time signal. **(04 Marks)**

b. What is a sample and hold circuit? With suitable sketch explain the major errors in S/H circuits. **(08 Marks)**

c. Find :
(i) The number of input combinations possible.
(ii) Value of 1 LSB
(iii) % accuracy and
(iv) Full scale voltage generated for a 16 bit DAC. Assume $V_{ref} = 5$ V. **(08 Marks)**

2 a. Explain with diagram a current steering DAC using binary weighted current sources. Discuss its merits and demerits. **(08 Marks)**

b. Design a 3 bit charge scaling DAC and find the value of the output voltage for $D_2, D_1, D_0 = 1\ 0\ 1$. Assume $V_{ref} = 5$ V and $C = 0.5$pF **(06 Marks)**

c. Discuss the issues in Mixed Signal layout. **(06 Marks)**

3 a. Explain the principle of cyclic DAC. How many clock cycles are required for each conversion? Obtain an expression for the output voltage, $V_{out}(n)$ at the end of n^{th} cycle of conversion. Assume output of initial $\frac{S}{H}$ circuit is zero. **(08 Marks)**

b. Consider a 6 bit cyclic DAC with an input value of $D_5D_4D_3D_2D_1D_0 = 1\ 1\ 0\ 1\ 0\ 1$ and $V_{ref} = 5$ V. Compute the value of the output voltage at the end of each cycle. **(08 Marks)**

c. Explain how conversion takes place at every clock cycle, after the initial N clock cycle delay, in a pipeline DAC. **(04 Marks)**

4 a. Give the circuit of preamplification stage of comparator and explain its working. **(10 Marks)**

b. With diagram explain the working of analog multiplier circuit. Derive expression for output voltage. **(10 Marks)**

PART – B

5 a. Show that with an input sinewave the ideal SNR of ADC is $6.02N + 1.76$ dB, where N is the number of bits. **(08 Marks)**

b. Determine the required resolution in terms of number of bits for an ADC with peak to peak voltage 1.5 V and a measured rms value of quantization error 2 mV. **(06 Marks)**

c. Explain how SNR can be improved in ADC using averaging. **(06 Marks)**

6 a. Explain how a decimating filter increases effective ADC resolution. **(08 Marks)**

b. Explain how an interpolating filter increases effective output resolution. **(08 Marks)**

c. What is the advantage of band pass averaging sine filters. Mention its applications with reference to ADC and DAC. **(04 Marks)**

7 a. With suitable diagram, explain basic CMOS process flow. **(08 Marks)**

b. Give the circuit of a basic NMOS switch. Sketch the variation of effective resistance with V_{DS}. **(06 Marks)**

c. What are the applications of delay elements? Give the circuit of simple delay element and explain its operation. **(06 Marks)**

8 a. Give the circuit to be used on the output of opamp to have (i) Widest possible output swing (ii) Low quiescent current and (iii) Good linearity **(10 Marks)**

b. Give the circuit of diff amp with source follower level shifters. Discuss its performance. **(10 Marks)**

* * * * *

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

10EC662

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Satellite 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 the following: i) Geosynchronous orbit ii) Geostationary orbit **(04 Marks)**

b. Explain the following: i) Earth eclipse of satellite ii) Sun transit outage. **(06 Marks)**

c. With the help of relevant diagram and equations explain the Kepler's three laws of planetary motion. **(10 Marks)**

2 a. What are the different losses occurs during the radio propagation in a satellite link? **(10 Marks)**

b. Derive the system noise temperature (T_S) expression for amplifiers connected in series. **(06 Marks)**

c. An LNA is connected to a receiver which has noise figure 12 dB. The gain of the LNA is 40 dB and its noise temperature is 120 K. Calculate the overall noise temperature referred to the LNA input. **(04 Marks)**

3 a. Explain what is meant by antenna noise temperature and amplifier noise temperature. **(06 Marks)**

b. Derive an expression for the carrier to noise in satellite link. **(07 Marks)**

c. Explain what is meant by input and output backoff. **(07 Marks)**

4 a. What is meant by satellite altitude control and briefly describe two forms of altitude controls? **(07 Marks)**

b. Explain what is meant by thermal control and why this is necessary in a satellite. **(06 Marks)**

c. Explain what is meant by frequency reuse, and describe briefly two methods by which this can be achieved. **(07 Marks)**

PART – B

5 a. With neat diagram, explain the master antenna TV system. **(10 Marks)**

b. With suitable diagram, explain the possible interference modes between satellite circuits and terrestrial station. **(10 Marks)**

6 a. With appropriate diagram, explain the operation of the spade system of channel assignment. **(10 Marks)**

b. Describe the general operating principles of TDMA system and also explain the different components of reference burst in a TDMA system. **(10 Marks)**

7 a. Explain the following: i) Power rating of transponders.
ii) Frequency and polarization.
iii) Transponder capacity. **(10 Marks)**

b. With neat diagram, explain MPEG-2 encoder used in digital video transmission. **(10 Marks)**

8 a. Explain the following satellite mobile services :
i) Asian cellular system ii) Globalstar iii) Thuraya **(10 Marks)**

b. Explain the following: i) VSAT ii) GPS **(10 Marks)**

* * * * *

USN | 1 | K | S | 1 | 3 | E | C | 0 | 5 | 7 |

10EC/TE61

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. State and prove sampling theorem for low pass signals assuming train of impulses for sampling. **(08 Marks)**

b. Explain the principle of quadrature sampling of band pass signals. **(06 Marks)**

c. The signal $g(t) = 4\cos(4\pi t)(\cos 400\pi t)$ is sampled at the rate of 500 samples per second:
i) Determine the spectrum of the resulting sampled signal.
ii) What is Nyquist rate for g(t)?
iii) What is cut off frequency of ideal reconstruction filter? **(06 Marks)**

2 a. With a suitable block diagram, explain the functioning of PCM system. **(10 Marks)**

b. Three independent message source of bandwidths 1 kHz, 1 kHz and 2 kHz respectively are to be transmitted using TDM scheme. Determine
i) The commutator segment arrangement.
ii) The speed of commutator if each signal is sampled at its Nyquist rate.
iii) Minimum transmission bandwidth. **(05 Marks)**

c. The bandwidth of signal input to PCM is restricted to 4 kHz. The input varies from −3.8 to 3.8 V and has average power of 30 mW. The required signal to noise ratio is 20 dB. The modulator produces binary output. Assume uniform quantization
i) Calculate the number of bits required per sample.
ii) Output of 30 such PCM coders are time multiplexed. What is the minimum required transmission bandwidth for multiplexed signal? **(05 Marks)**

3 a. With neat diagram, explain the operation of DPCM. **(06 Marks)**

b. Derive the expression for output signal to quantization noise ratio of a delta modulator. **(10 Marks)**

c. Assume a speech signal with a minimum frequency of 3.4 kHz and a maximum amplitude of 1 V. The speech signal is applied to a delta modulator with its bit rate at 25 kbps. Discuss the choise of an appropriate step size for a delta modulator. **(04 Marks)**

4 a. Describe Nyquist criteria for distortionless baseband transmission. **(06 Marks)**

b. A binary data sequence is 10110100. Sketch the waveforms for the following formats:
(i) Unipolar NRZ (ii) Unipolar RZ (iii) Polar NRZ (iv) Polar RZ
(v) Manchester coding (vi) Bipolar NRZ. **(06 Marks)**

c. With a neat structure explain concept of adaptive equalization process. **(08 Marks)**

PART – B

5 a. Show that probability of symbol error for frequency shift keying is $P_e = \frac{1}{2}\text{erfc}\left(\sqrt{\frac{\varepsilon_b}{2N_0}}\right)$. **(12 Marks)**

b. With a block diagram of QPSK transmitter and receiver explain generation and demodulation of a QPSK wave. **(08 Marks)**

6 a. Explain the importance of geometric interpretation of signals. Illustrate the geometric interpretation of signals for the case of 2-dimensional signal space with 3 signals. **(08 Marks)**

b. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are as shown. Apply Gram-Schmidt procedure to obtain an orthonormal basis for the signals. Express the signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ in terms of orthonormal basis functions. Also give the signal constellation diagram. **(12 Marks)**

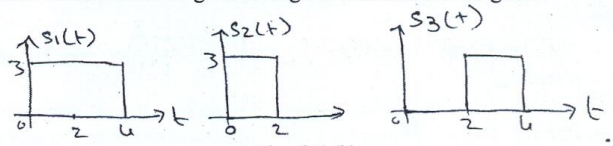

Fig. Q6 (b)

7 a. Derive the expression for maximum signal to noise power ratio of a matched filter. **(12 Marks)**

b. Explain the working of a correlation receiver with block diagram of a detector and vector receiver. **(08 Marks)**

8 a. Explain direct sequence spread spectrum technique with block diagram. **(08 Marks)**

b. Differentiate slow frequency hopping and fast frequency hopping. **(05 Marks)**

c. A 3-stage shift register with a linear feedback generates the sequence : 01011100101110

i) Determine the period of the given infinite sequence.

ii) Verify the three properties of the PN sequence for the given sequence. **(07 Marks)**

* * * * *

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

10EC/TE62

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Microprocessor

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 architecture of 8086 microprocessor with a neat block diagram. **(10 Marks)**

b. Define addressing modes of 8086 and identify the addressing modes of the following instructions: i) add ax, [si] ii) mov al, [1000] iii) mov [bx + si + 06], bl iv) mov bx, [bp + 50] **(10 Marks)**

2 a. Discuss the functions of following instructions:
i) xlat ii) aam iii) das iv) imul bx
v) lds bx, [1234h] **(10 Marks)**

b. Write an ALP to multiply two-16 bit packed BCD numbers. **(06 Marks)**

c. Define the following assembler directives:
i) ALIGN ii) EVEN iii) ENDS iv) LOCAL **(04 Marks)**

3 a. Describe the following string instructions :
i) repe movsb ii) cmpsb iii) scasb iv) lodsb **(08 Marks)**

b. Write an ALP to scan for a character in a string and replace by another character. Use assembler directives. **(08 Marks)**

c. Write a program to convert binary byte to ASCII equivalent. **(04 Marks)**

4 a. Define an interrupt. Explain 8086 interupts and response mechanism. **(08 Marks)**

b. Write a macro for the following cases:
i) Read a character from keyboard without echo.
ii) Display a message on the CRT monitor.
iii) Display an integer on CRT monitor. **(06 Marks)**

c. Write a subroutine to print a string on printer. Call this subroutine from a main program to print two message strings. **(06 Marks)**

PART – B

5 a. Interface 4×4 keyboard to 8086 microprocessor using 8255 PPI. Write the necessary circuit diagram and program. **(10 Marks)**

b. Write an ALP to interface seven segment display to 8086 and demonstrate the display as flashing display. Write the necessary circuit diagram. **(10 Marks)**

6 a. Write the control word format of 8087 and define various fields. **(04 Marks)**

b. What are the functions of following 8087 instructions? Explain.
(i) FENI (ii) FCOMP (iii) FSTENV (iv) FLDL2E
(v) FLDZ **(10 Marks)**

c. Write 8087 ALP to compute the volume of the sphere. **(06 Marks)**

7 a. With a neat block diagram, explain the maximum mode operation of 8086. **(10 Marks)**

b. What are the characteristics of PCI and USB interface? **(06 Marks)**

c. Show an interface of printer to a 8086 microprocessor. Define the signals of importance. **(04 Marks)**

8 Write short notes for the following:

a. Pentium microprocessor. **(08 Marks)**

b. Special registers of 80386. **(06 Marks)**

c. Memory structure of 80386. **(06 Marks)**

* * * * *

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

10TE63

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Antenna 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 parameters that are related to antennas:
i) Directivity ii) Radiation intensity iii) Beam width. **(09 Marks)**

b. Derive FRII's transmission formula. **(05 Marks)**

c. What is the maximum power radiates at a distance of 0.5km over a free space. The operating frequency is 1000 MHz. The transmitting antenna has a gain of 25dB and the receiving antenna a gain of 20dB. Gains are defined with respect to isotropic source. The transmitting antenna has an input power of 150W. **(06 Marks)**

2 a. Explain the different radiation patterns for an antenna. **(06 Marks)**

b. Obtain the value of electric field intensity in the case of array of 'n' isotropic sources. **(08 Marks)**

c. Calculate the distance between the elements of a broad side array whose beam width between first null's is found to be 45° at a frequency of 10MHz. There are 8 elements in the array. **(06 Marks)**

3 a. Obtain the electric field intensity in the case of a thin linear antenna. **(10 Marks)**

b. Calculate the value of radiation resistance in the case of a short dipole. **(06 Marks)**

c. Obtain the value of directivity when two isotropic sources are oppositely excited. **(04 Marks)**

4 a. Explain with neat diagrams different types of slot antenna and its working concept. **(08 Marks)**

b. Obtain the value of impedance of slot antenna in terms of its complementary dipole antenna impedance Z_d. **(06 Marks)**

c. Explain rectangular and circular Horn Antennas with neat diagrams. **(06 Marks)**

PART – B

5 a. Explain with a neat diagram the working of a front feed and cassegrain feed arrangement for a parabolic dish antenna. **(10 Marks)**

b. Calculate the diameter of a parabolic reflector if the gain is 75dB at 15GHz, area factor is 0.65. **(05 Marks)**

c. Give a explanatory note on corner reflectors. **(05 Marks)**

6 a. Explain with a neat diagram the different modes in helical antenna and give all the empirical parameter values for helical antenna. **(09 Marks)**

b. A helical antenna has 10 turns, 100mm diameter and 70mm turn spacing. The operating frequency is 1GHz. What is the directivity and polarization state? **(06 Marks)**

c. Explain a Yagi-Uda Antenna structure with a neat diagram. **(05 Marks)**

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

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

c. A transmitter radiates 100 watts of power at a frequency of 50 MHz in space-wave propagation. The transmitting antenna has a gain of 5 and a height of 50 mtrs. The receiving antenna height is 2 mtrs. It is estimated that a field strength of 100μr/mt is required to give satisfactory signals at the receiver. Calculate the distance between the transmitting and receiving antennas assuming flat earth. **(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 and ii) Skip distance for ionosphere. **(05 Marks)**

c. Calculate 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)**

* * * * *

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

10TE64

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Microwave and Radar

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Starting from the definition of reflection coefficient in terms of normalized load impedance, deduce the equations that define the family of constant resistance and reactance circles in Smith chart. Give neat sketches for each. **(10 Marks)**

b. A single stub is used in shunt to match a lossless line of 400 Ω to a load of 800 – j300. The frequency of operation is 3 GHz. Determine the location of the stub from the load and the length of the stub. Give analytical formulae for both and verify using smith chart. Give step-by-step procedure. **(10 Marks)**

2 a. Deduce the field expressions for a TE_{mn} wave in a rectangular waveguide of dimensions a × b cm. Give expressions for the cutoff frequencies, phase velocity, guide wavelength and guide impedance. **(10 Marks)**

b. Describe the construction of a rectangular waveguide coupler. Define coupling, directivity, transmission loss and return loss. Deduce the S matrix for the coupler. **(06 Marks)**

c. A directional coupler of 10 dB coupling and 40 dB directivity produces a transmission loss of 1 dB. Calculate the power at all other ports when input power at port 1 is 10 mw. **(04 Marks)**

3 a. Explain the principle of operation of read diode with neat diagram. **(08 Marks)**

b. Derive expression for the power output and efficiency of Impatt Diode. **(06 Marks)**

c. Draw the equivalent circuit of a parametric amplifier. Explain parametric upconverter. Give formulae for gain, noise figure and band width. **(06 Marks)**

4 a. For a 4 port network, define and give the S matrix. Discuss some properties of S matrix. **(08 Marks)**

b. Two transmission lines of characteristic impedances Z_1 and Z_2 are coupled to form a two port network. Deduce the S matrix in terms of Z_1 and Z_2. **(06 Marks)**

c. Derive expressions for the reflection coefficients at input and output in terms of S parameters under mismatched load conditions. **(06 Marks)**

PART – B

5 a. With a neat diagram, explain the constitution and functioning of a precision rotary type phase shifter. **(06 Marks)**

b. With a neat diagram, explain the function of the magic tee. Deduce its S matrix. **(08 Marks)**

c. Explain with a neat diagram faraday rotation based isolator. **(06 Marks)**

6 a. Explain with neat diagrams the structure and field pattern of a microstripline. Give expression for characteristic impedance, dielectric and Ohmic losses. **(08 Marks)**

b. Explain with a diagram the construction of a parallel stripline. Give expressions for the distributed parameters of the line. **(06 Marks)**

c. A shield stripline has the following parameters :
Relative dielectric constant = 2.25 Strip width = 2 mm
Strip thickness = 0.5 mm Strip Depth = 4 mm
Calculate: (i) K factor (ii) Fringe capacitance (iii) Characteristic impedance. **(06 Marks)**

7 a. Derive expression for the basic radar equation explaining all the parameters. **(10 Marks)**

b. With a neat block diagram, explain the fu7nctional blocks of a moving target detection. **(10 Marks)**

8 a. Derive an expression for the frequency response of a three pulse digital canceller. Plot the response characteristic. **(10 Marks)**

b. Write brief notes on:
i) Blind speeds and techniques to avoid blind speeds.
ii) Radar frequencies and various applications. **(10 Marks)**

* * * * *

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

10TE65

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. Justify that the information content of a message is a logarithmic function of its probability. **(06 Marks)**

b. A card is drawn from a deck of playing cards.

i) You are informed that the card you draw is a spade. How much information did you received in bits?

ii) How much information do you receive if you are told that the card that you drew is an ace?

iii) How much information do you receive if you are told that the card you drew is an "ace of spades"?

Is the information content of the message "ace of spades" the sum of the information contents of the messages "spade" and "ace"? What do you conclude? **(04 Marks)**

c. For the given first order Markov source in Fig.Q.1(c). Find: i) Entropy of each state; ii) Entropy of source; iii) G_1 and G_2 and verify $G_1 \geq G_2 \geq H$. **(10 Marks)**

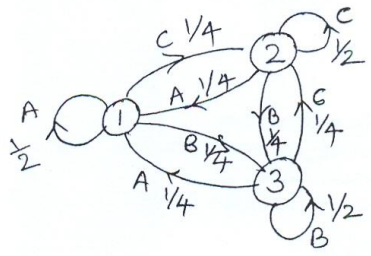

Fig.Q1(c)

2 a. Explain the important properties of codes to be considered while encoding a source. **(06 Marks)**

b. State and explain Kraft inequality. **(04 Marks)**

c. Explain Shannon encoding algorithm. Design an encoder using Shannon encoding algorithm for a source having 5 symbols and probability statistics $P = \left\{\frac{1}{8}, \frac{1}{16}, \frac{3}{16}, \frac{1}{4}, \frac{3}{8}\right\}$. Find coding efficiency and redundancy. **(10 Marks)**

3 a. Consider a source $S = \{S_1, S_2, S_3\}$ with $P = \left\{\frac{1}{2}, \frac{1}{3}, \frac{1}{6}\right\}$.

i) Determine the binary codewords using Huffman's encoding procedure.

ii) If the same technique is applied to the 2nd order extension of the source how much will the code efficiency be improved.

iii) Comment on the result. **(10 Marks)**

b. A BSC channel has the following noise matrix with source probabilities:

$$P(x_1) = \frac{3}{4} \quad \text{and} \quad P(x_2) = \frac{1}{4} \qquad P(Y/X) = \begin{bmatrix} 2/3 & 1/3 \\ 1/3 & 2/3 \end{bmatrix}$$

Determine: i) H(x), H(y), H(x, y), H(x/y), H(y/x) and I(x, y); ii) Capacity, efficiency and redundancy of the channel. **(10 Marks)**

4 a. State and explain the Shannon-Hartley law. Obtain an expression for the maximum capacity of a continuous channel. **(10 Marks)**

b. A black and white television picture may be viewed as consisting of approximately 3×10^5 elements, each one of which may occupy one of 10 distinct brightness levels with equal probability. Assume the rate of transmission to be 30 picture frames per second, and the signal to noise power ratio is 30 dB. Using the channel capacity theorem, calculate the minimum bandwidth required to support the transmission of the resultant video signal. **(05 Marks)**

c. A voice grade channel of the telephone network has a bandwidth of 3.4 kHz.
   i) Calculate channel capacity of the telephone channel for a signal to noise ratio of 30dB.
   ii) Calculate the minimum signal to noise ratio required to support information transmission through the telephone channel at the rate of 4800 bits/sec. **(05 Marks)**

PART – B

5 a. For a systematic (6, 3) linear block code

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

   i) Find all the code vectors.
   ii) Error detecting and error correcting capabilities.
   iii) Draw encoder circuit.
   iv) If the received vector R = 010110. Detect and correct the single error present in it. **(10 Marks)**

b. Prove that $CH^T = 0$. **(04 Marks)**

c. Why do we need error control coding? What are the types of errors and types of coding to combat them? **(06 Marks)**

6 a. The generator polynomial of a (7, 4) cyclic code is $g(x) = 1 + x + x^3$.
   i) Find the code words for messages 1010 and 1101 both in systematic and non-systematic form.
   ii) Find generator and parity check matrices.
   iii) Draw the encoder diagram. **(10 Marks)**

b. A (15, 5) linear cyclic code has a generator polynomial:
$g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}$
   i) Draw the block diagram of syndrome calculator circuit.
   ii) Is $V(x) = 1 + x^4 + x^6 + x^8 + x^{14}$ a code polynomial? If not, find the syndrome of V(x).
   iii) Find the code polynomial $D(x) = 1 + x^2 + x^4$ in systematic form. **(10 Marks)**

7 Write short notes on:
a. RS codes
b. BCH codes
c. Golay codes
d. Burst and random error correcting codes. **(20 Marks)**

8 a. Consider the (3, 1, 2) convolutional 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 codeword corresponding to the message sequence [1 1 1 0 1] using time domain and transform domain approach. **(10 Marks)**

b. Consider the convolutional encoder shown:

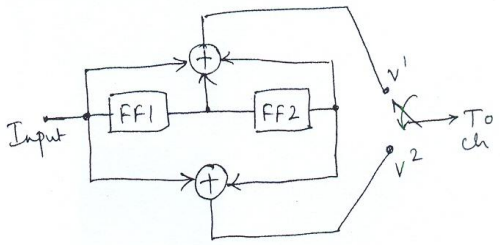

Fig.Q.8(b)

i) State transition table
ii) Code tree for 3 intervals
iii) Using code tree find the codeword corresponding to the message (1 0 1 1 1). **(10 Marks)**

* * * * *

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

10TE661

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. Briefly discuss about preprocessor directives. **(08 Marks)**

b. Describe any two features of OOPS. **(06 Marks)**

c. Distinguish between :
   i) Static and dynamic memory allocation
   ii) Pointers and reference. **(06 Marks)**

2 a. Describe the different operations defined in C++ string class. **(06 Marks)**

b. What is a constant qualifier and what are the restriction associated with it? **(06 Marks)**

c. Identify the mistakes if any and correct them :

i)
```
int staff_size = 40 ;
  int sal[staff_size];
```

ii)
```
int main( )
  {
   float fval;
   int ival;
   double P1;
   P1 = fval = ival = 0;
   return 0;
  }
```

iii)
```
# if(max > 100)
   num = 100 ;
   #elseif(max < 100)
    num = 1000;
   #else
    num = 10 ;
   #endif
```

iv)
```
/* this is an outer comment x = 2/y;
   /* this is an inner comment x = x + 2j */ */
```

(08 Marks)

3 a. Explain conditional operator and write a C++ program to find the largest of three numbers using conditional operator. **(07 Marks)**

b. Describe any two looping structures in C++. **(06 Marks)**

c. Write a program to find the location of an element in the array using if statement. **(07 Marks)**

4 a. Write a program to swap two numbers using function, and print the original and swapped values in the main. **(07 Marks)**

b. What is recursive function? Write a program to calculate the factorial of a number using recursive function. **(07 Marks)**

c. Explain inline function and write the rules for inline function. **(06 Marks)**

PART – B

5 a. Explain the concept of exception handling with syntax and example. **(10 Marks)**

b. Write short notes on :
i) Rethrow
ii) catch-all handler. **(10 Marks)**

6 a. Describe class and objects. Explain different access specifiers with an example. **(10 Marks)**

b. Explain the friend function. Write a program to find the sum of two numbers using a friend function. **(10 Marks)**

7 a. Describe operator overloading, with general syntax describe the process of operator overloading. **(10 Marks)**

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

8 a. What is inheritance? Explain public, private and protected means of inheritance with an example. **(10 Marks)**

b. Describe the concept of virtual inheritance with an example. **(10 Marks)**

* * * * *

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

10TE664

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. Explain the characteristics of open-loop adaptation and closed-loop adaptation with examples. **(08 Marks)**

b. With neat block diagrams, explain how the adaptive system can be used for the following: i) Prediction; ii) System identification (modeling). **(08 Marks)**

c. What is interference? How it can be cancelled using adaptive filters. **(04 Marks)**

2 a. Obtain the general expression for mean square error in terms of input correlation matrix for a multiple-input adaptive linear combiner with desired response and error signals (Assume that the inputs, desired response and the error signals are statistically stationary). **(08 Marks)**

b. An adaptive linear combiner is shown in Fig.Q.2(b).

i) Derive an expression for the performance function in terms of weights and inputs.

ii) Find the optimum weight vector for N = 10.

iii) Write the expression for output y_k and show that $y_k = d_k$. **(12 Marks)**

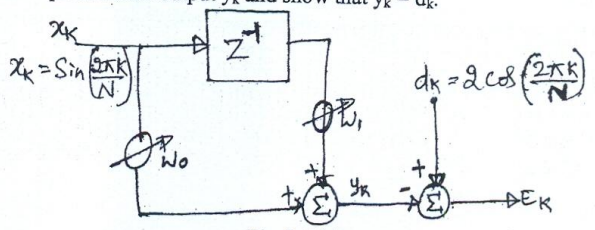

Fig.Q.2(b)

3 a. Explain the eigen values and eigen vectors of the input correlation matrix of a adaptive system. Describe the geometrical significance of eigen vectors and eigen values, with a diagrams **(10 Marks)**

b. An adaptive system with two weights has the input correlation matrix and cross-correlation vector.

$$R = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \quad \text{and} \quad P = \begin{bmatrix} 7 \\ 8 \end{bmatrix}$$

Find the optimum weight vector, W* and the normalized matrix of eigen vector Q. **(10 Marks)**

4 a. Describe the following algorithms used in adaptive signal processing:
i) Gradient search algorithm; ii) Steepest descent algorithm. **(12 Marks)**

b. A single-weight performance surface has the parameters $\lambda = 0.1$, $\xi_{min} = 0$ and $w^* = 2$. Write an expression for this performance surface. What are the first four choices of W using the simple gradient search method if the initial guess is $W = 0$ and $\mu = 4$. **(08 Marks)**

PART – B

5 a. Derive an expression for the variance of the gradient estimate considering that the probability density of ϵ_x is distributed normally with zero mean and with a variance of σ_ϵ^2. **(08 Marks)**

b. Derive an expression for excess mean square error of Newton's method. Mention the advantages of Newton's method over steepest-descent methods. **(08 Marks)**

c. Define the terms misadjustment and perturbation. **(04 Marks)**

6 a. Explain LMS algorithm. Derive an expression for weight adjustment. Illustrate the convergence of the mean weight vector with example. **(12 Marks)**

b. Obtain an expression for misadjustment using LMS algorithm. **(08 Marks)**

7 a. Explain the adaptive modeling of a multipath communication channel in a spread spectrum system with a block diagram. **(08 Marks)**

b. Describe how adaptive modeling is used in the following cases with simple block diagrams: i) Geophysical exploration; ii) Digital filter synthesis. **(12 Marks)**

8 a. Explain the concept of adaptive noise canceling with block diagram. **(08 Marks)**

b. With block diagram, explain the following:
   i) Adaptive interference canceller as a notch filter.
   ii) Adaptive interference canceller as a high-pass filter. **(12 Marks)**

* * * * *