

B. Tech. 5th SEMESTER END TERM EXAMINATION 2017

Subject Name: Numerical Methods and Analysis

Subject Code: UEC05C18

Full Marks: 100

Time: 3 hours

Symbols used here have their usual meanings

Group - A

Answer any 10 (ten) questions from the following. Each question carry 05 marks:

[5 × 10 = 50]

1. Evaluate the value of $\int_{0.4}^{1.6} \frac{x}{\sinh x} dx$, taking 13-ordinates by Weddle's Rule correct to five decimal places.

2. Establish the Richards extrapolation method?

3. Use Stirling's formula to compute $\tan 89^{\circ} 26'$, from the following table

x	89° 21'	89° 23'	89° 25'	89° 27'	89° 29'
tanx	88.14	92.91	98.22	104.17	110.90

4. Compute the value of y for x=0.72 from the following table using Newton's divided difference formula.

x	0.62	0.68	0.70	0.73	0.75
y	0.6604	0.7336	0.7585	0.7965	0.8223

5. Establish the Gauss Legendre Quadrature formula and hence the Simpsons's three-eight composite rule.

6. Find the value of y for x=0.3 from the following differential equations by Runge-Kutta Method, correct up-to 4 decimal places with usual notations:

$$\frac{dy}{dx} = x - y; \quad y(0) = 1; \quad h = 0.1$$

7. Establish the Gauss Elimination Method.

8. The velocity v km/min of a moped started from rest is given at fixed interval of time t (minutes) as follows:

t:	2	4	6	8	10	12	14	16	18	20
v:	10	18	25	29	32	20	11	5	2	0

Using Simpson's 1/3 Rule, find the distance covered in 20 minutes

9. Find the first, second and third order derivatives of the function y=f(x) tabulated below; at the points x=1.5 and x=4 using any suitable interpolation formula.

x:	1.5	2.0	2.5	3.0	3.5	4.0
f(x):	3.375	7.000	13.625	24.000	38.875	59.000

10. Determine by Lagrange's method the percentage number of patients over 40 years, using the following data

Age over(x) years	30	35	45	55
Percentage number(y) of patients	148	96	68	34

11. The following data gives the values of the elliptic integral $f(x) = \int_0^x \frac{d\theta}{\sqrt{1 - \frac{1}{2}\sin^2 \theta}}$ for certain equidistant values of x°. Find the value of $\int_0^{23.5} \frac{d\theta}{\sqrt{1 - \frac{1}{2}\sin^2 \theta}}$ using any suitable interpolation formula.

x	21°	22°	23°	24°	25°	26°
f(x)	0.3706	0.3887	0.4068	0.4250	0.4433	0.4616

- 12/ Compute the value of y for $x=0.05$ and $x=0.1$ by Euler's Modified method correct upto four decimal places from the differential equation $\frac{dy}{dx} = x + y$ with initial condition $y(0)=1$

Group - B

Answer any 05(five) questions from the following:

[$10 \times 5 = 50$]

13. Derive Regula-Falsi method and hence find a real root of $2x - \log x = 7$ correct up to 3 decimal places.

[4 + 6]

14. (a) Define factorial power of a function. Show that $x^{(-n)} = \frac{1}{(x+n)^n}$ if the interval of differencing be unity.

- (b) For a function $f(x)$, $f(0) + f(8) = 1.92, f(1) + f(7) = 1.95, f(2) + f(6) = 1.98, f(3) + f(5) = 1.99$. Find the value of $f(4)$, the interval of differencing is unity.

[5 + 5]

15. (a) Solve the system of linear equation by matrix factorization method.

$$x - 5y + z = 2, 2x + 4y + z = 1, x + y + z = 0$$

- (b) Find the value of $\sqrt[4]{12}$ using Newton-Raphson method correct up to 2 decimal places

[7 + 3]

16. (a) Compute all Eigen value and the corresponding Eigen vector of the matrix using Jacobi method:

$$\begin{pmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{pmatrix}$$

- (b) Give the geometrical interpretation of Newton-Raphson method.

[8 + 2]

17. (a) Derive the normal equation for parabolic curve.

- (b) Determine the values of a and b so that the equation $y = ax^b$ best fits the following data by the method of least square.

x	25	20	12	9	7	5
y	0.22	0.20	0.15	0.13	0.12	0.10

[2 + 8]

18. (a) Solve the following system of linear equation using Gauss-Seidal method correct up to 3 decimal places.

$$2x + 10y + z = 13, 10x + y + z = 12, 2x + 2y + 10z = 14$$

- (b) Prove that $e^{-hD} = 1 - \nabla$.

[8 + 2]

Full Marks : 100Attempt Q1 and any Four from the rest.Marks

Q1 A) Represent the binary bit sequence '11010011' using i) Polar RZ Line coding ii) Manchester Coding. (10X2)

B) Write down the properties of Matched Filter.

C) What is aliasing effect?

D) Define Slope overload noise.

E) Draw the constellation diagram of BFSK.

F) Explain the coherent detection of BASK.

G) Find the PSD of a RZ rectangular pulse.

H) What is entropy?

I) What are the properties of Information?

J) What is orthonormal basis function?

(3+12+5)

A) Write down the salient features of line coding technique.

B) Determine the PSD of a polar line coding technique. Also write the merits and demerits associated with Polar line coding.

C) How can transparency of 'Bipolar line coding' achieved with HDB3 technique.

A) How impulse response of the optimum receiver filter is matched with input message signal? (10+10)

B) Find the expression and represent the natural sampled signal in time and frequency domain.

A) What are the main reasons for ISI? Explain ISI with supporting mathematical expression. (5+10+5)

B) Explain the Nyquist first criteria for zero ISI along with Raised cosine signal.

C) How duo binary signal can detect single bit error?

(8+8+4)

A) Explain the generation and detection of BPSK signal with suitable diagrams.

Q5X

~~B~~ Draw the constellation diagram of QPSK and find out the essential transmission bandwidth of QPSK signal.

~~C~~ Explain the principle of Adaptive Delta Modulation

Q6 A) Find out the probability of error in BASK technique.

(7+5+8)

B) A television signal has a bandwidth of 4.5 MHz and the signal is sampled, quantized and binary coded to obtain a PCM signal.

i) Determine the sampling rate if the signal is to be sampled at a rate of 20% above the Nyquist rate.

ii) If the samples are quantized into 1024 levels, determine the number of binary pulses required to encode each sample.

iii) Determine the binary pulse rate (bits per second) of the binary coded signal and also the minimum bandwidth required to transmit this signal.

~~C~~ Write short notes (any one)

i) DPSK

ii) DPCM

Full Marks: 100

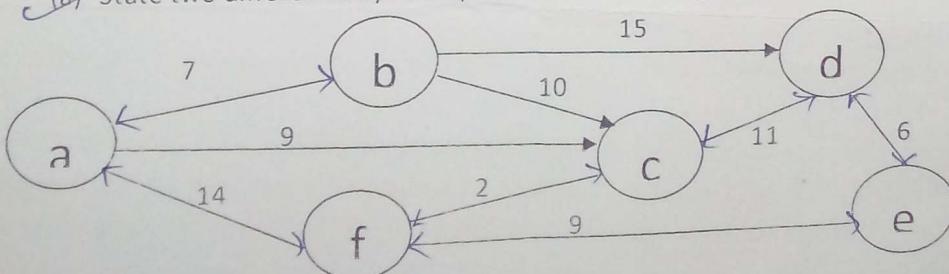
Time: 3Hr

The figures in the margin indicate full marks for the questions
 Answer question 1 and 4(four) questions from the rest.

1. Answer any ten(10) questions. Answer should be to the point without unnecessary elaboration. $10 \times 2 = 20$
- A) Which type of linked list is used to represent Binary tree? Explain with examples.
 B) What is a LIFO system?
 C) Suppose p and q are two nodes of the linked list. Assume that neither p nor q contains NULL value. Which Boolean expression indicates whether (a) the numbers in two nodes (p and q) are not equal (b) the number in p is greater than the number in q (c) the number in q is greater than the number in p.
 D) What is linear and non-linear data structure? Explain with example
 E) What is weighted graph? What is directed graph?
 F) What is a Double circular linked list explain with examples?
 G) Which data structures are applied when dealing with a recursive function? Justify your answer with proper reasons.
 H) How does dynamic memory allocation help in managing data?
 I) Differentiate NULL and VOID pointer.
 J) What is the advantage of the heap over a stack?
 K) Give a basic algorithm for searching a binary search tree.

2. $(2+1)+(1+2)+2+2+(3+3)+2+2$
- (a) What is a hash function? Name two desirable properties of a hash function.
 (b) Define a hash function and create a hash table by using open addressing linear probe to avoid collision for the following values :
 $\{8, 2, 7, 18, 15, 19, 23, 15, 20, 16\}$
 (c) Create a hash table by using open addressing quadratic probing to avoid collision for the values in previous question.
 (d) Create a hash table by using separate chaining to avoid collision for the values in question 2(b).
 (e) State the advantages and disadvantages of open addressing method over separate chaining method for collision avoidance.
 (f) What is the clustering problem in hash tables?
 (g) Calculate time complexity to access a value in hash table.

3. $(2+2)+(2+2)+2+4+3+(1+1+1)$
- (a) State two different ways to represent the following graph in memory.



- ✓ (b) Discuss the characteristics of two ways of representation for a graph in terms of storage requirements and worst-case performance.
- ✓ (c) What is minimum spanning tree?
- ✓ (d) Discuss the prim's algorithm for finding minimum spanning tree.
- ✓ (e) Explain prim's algorithm using the graph at question (3a).
- ✓ (f) What do you mean by vertices, edge and path.

4.

$$\begin{array}{cccccc} a & b & c & d & e & f \\ 2+4+4+(4+3)+3 \end{array}$$

- (a) Suppose that a selection sort of 100 items has completed 42 iterations of the main loop. How many items are now guaranteed to be in their final spot (never to be moved again)? Without proper justification no marks will be awarded.
- (b) You have an array of five elements with following values: [64 25 12 22 11]. Write the different steps of quick sort algorithm to sort the array. After each iteration show the status of the array
- (c) Calculate the worst case time complexity of quick sort.
- (d) Explain the logic of Merge Sort with its algorithm. Also give its complexity analysis.
- (e) Provide a comparison between selection sort, insertion sort and bubble sort

5.

$$2+3+1+6+2+(3+3)$$

- (a) What is asymptotic analysis?
- (b) What is asymptotic notation? Explain with examples.
- (c) What do you mean by unbalanced tree?
- (d) Write a process to insert an element in AVL tree.
- (e) You are working on an embedded device (an ATM) that only has 4KB (4,096 bytes) of free memory, and you wish to sort the 2,000,000 transactions withdrawal history by the amount of money withdrawn. Which sorting algorithm you will use and why?
- (f) Define breadth-first search and depth first search algorithm. Give the pseudo code for each.

6.

$$2+4+4+6+4$$

- (a) What is complete binary tree and extended binary tree?
- (b) Using the operations of the stack and queue, write an algorithm that determines if a string is a palindrome (i.e. reads the same backward and forward; e.g. "level").
- (c) Write an algorithm that counts the number of times a given integer value occurs in a singular link list.
- (d) Suppose there is a circular road and there are 4 petrol pumps {A,B,C,D} on the road. Amount of petrol and distance to next petrol pump value given in pairs as {4, 6}, {6, 5}, {7, 3} and {4, 5}. Write an algorithm with time complexity O(n) to determine the first point from where a truck will be able to complete the circle (The truck will stop at each petrol pump and it has infinite capacity). Assume for 1 unit of petrol, the truck can go 1 unit of distance.
- (e) Write the differences between pre order and post order traversal

-----End of Question Paper-----

B. Tech 5th Semester End-Term Examination, 2017
 Microprocessors & Microcontrollers
 UEC05B13

Full Marks: 100

Time: 3 hours

Answer Section A and Section B separately on same answer scriptSection-AAnswer any SIX (06) questions

[15 X 6 = 90]

~~X~~ 1. ~~X~~ Write an 8085 program to multiply two 8-bit numbers available in memory locations 8000H and 8001H by repeated addition and store the result in memory locations 9000H and 9001H. [8]

~~X~~ Draw the timing diagram of any one of the following instructions. [7]
 (a) LDAX Rp (b) STA 9000H

~~A~~ 2. i) Interface three (8K X 8) EPROM chips with 8085 using NAND decoder. Take the starting addresses as 0000H, 4000H and 8000H for the three chips. [8]

ii) Name the hardware interrupts of 8085 in descending order of priority and calculate the vector addresses. Explain the control register of SIM instruction? [3+4]

~~A~~ 3. i) Write a control word in BSR mode of 8255. [5]

ii) Write a control word in I/O mode of 8255 for the following port configurations.
 Port A= input (mode 1) Port B= output (mode 0)
 Port C upper= input Port C lower= output

iii) Write the control word format and necessary instruction to configure the ports of the 8255 as given: port A= input, port B= output, P_{CU}= output, P_{CL}= input. Assume that the four registers of the 8255 PPI are located at 60H - 63H. [5]

~~A~~ 4. i) Explain the pipelining architecture? What is the maximum frequency and duty cycle of the clock signal given to the 8086 microprocessor? What is the total memory allocated by 8086 microprocessor? [4+3+2]

ii) Write the different memory segments used in 8086 system and their functions. Also name the corresponding offset registers used for the different segments. [3+3]

~~A~~ 5. ~~X~~ If the content of BP=4000H and SI= 3000H, what is the value present in CX after the 8086 executes the instructions LEA CX, [BP+SI] and LEA CX, [SI+10H]. [3+3]

~~X~~ Describe the Bus Interface Unit of 8086 with proper block diagram and write the function of the different registers. [9]

~~A~~ 6. i) How is the 20-bit physical memory address calculated in the 8086 processor? Explain with an example. [4]

ii) If the content of the DS and BX registers is 4500H and 2000H, respectively, in which memory location will the 8086 fetch the data, while executing the instruction MOV CX, [BX-50H]? Explain elaborately. [4]

iii) What is Assembler Directive? Explain with example, the function of the following assembler directives:

a) EVEN

b) PROC

[7]

A. 7. i) Explain the minimum mode and maximum mode in 8086? [5]

ii) Write the function of the following pins of 8086.

(a) TEST

(b) LOCK

(c) DT/R

(d) DEN

(e) BHE/S₇

[10]

A. 8. What is the difference between program memory direct addressing and program memory relative addressing mode in 8086? Explain with examples. [5]

i) Explain with example, the functions of the different flags in the 8086 microprocessor. [5]

ii) Write the difference between polling and interrupt. Explain with example. [5]

A. 9. i) What is the function of segment override prefix? Explain with an example. [3]

ii) Explain the operation of the following instructions of 8086 microprocessor with example:

(a) DAA

(b) SAHF

(c) CMPSW

(d) WAIT

(e) CMP

[10]

iii) Write the steps involved, when an interrupt has been requested to 8086 microprocessor. [2]

Section-B

All Questions are Compulsory

[5 X 2 = 10]

B. 1. Write the differences between Memory-mapped IO and I/O-mapped IO.

B. 2. Find the data directions and modes of operation of the 8255 ports, if the control word written into it is A2H.

B. 3. What is the function of T and I flags in the 8086 when and how can they be set and reset?

B. 4. Explain with example the Base~~I~~ Indexed with Displacement Addressing mode.

B. 5. Explain how different port registers and control register of 8255 PPI is selected.

B.Tech 5th Semester End-Term Examination, 2017
 Name of Subject: Antenna & Wave Propagation
 Paper code: UEC05B12

Full Marks: 100

Time: 3Hr

*The figures in the margin indicate full marks for the questions**Answer any five questions from the following including Q.No.1 which is compulsory.*

1. a) What are isotropic, omni-directional and directional radiation patterns? Give one example for each [3]

b) The radiation intensity of an antenna is given by

$$U = \cos^4 \theta \sin^2 \theta, 0 \leq \theta \leq \frac{\pi}{2}, 0 \leq \phi \leq 2\pi$$

Find:

- i)* The exact directivity in dB
ii) Elevation plane HPBW [6]

c) What are LHCP & RHCP? Give example for each.

The instantaneous electric field vector of a wave propagating in the positive r direction, at a fixed point in space, is given by

$$E(t) = a_\theta \cos(\omega t) - a_0 \cos(\omega t + \frac{\pi}{4})$$

Plot the polarization of the field vector and describe the polarization of the wave.

[4+2=6]

d) Differentiate between Gain and Directivity of an antenna. Determine the beam solid angle for an antenna whose radiation intensity is given as

$$U(\theta, \phi) = B_0 \cos \theta, 0 \leq \theta \leq \frac{\pi}{2}, 0 \leq \phi \leq 2\pi$$

[3+2=5]

2. a) Determine the far zone spherical electric and magnetic field components radiated by a dipole whose current distribution can be approximated by

$$I_z(z') = I_0 \cos\left(\frac{\pi z'}{l}\right), -\frac{l}{2} \leq z' \leq \frac{l}{2}$$

Also determine the directivity of the antenna. [8+2=10]

b) Plot the normalized elevation plane power pattern for a thin dipole of length i) 0.5λ
 ii) 1.5λ . Also determine the corresponding HPBW. [6]

c) For a linear wire antenna having a maximum dimension D, find the inner and outer boundaries of the Fresnel region so that the maximum phase error does not exceed $\pi/16$ radian. [4]

3. a) Explain pattern multiplication in an array with an example. Which factors affect the array factor? [6]

b) Show that the maxima of the array factor of a two element array (with the elements placed along the z axis, one at $z=0$ and the other at a distance 'd' in the positive z direction) with excitations $I_1 = e^{j0.5kd}$ and $I_2 = e^{-j0.5kd}$ are given by

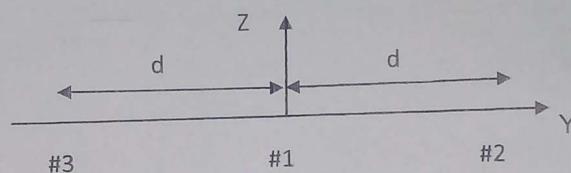
$$\theta_m = \cos^{-1}\left(\frac{\pm 2m\pi + kd}{kd}\right); m = 0, 1, 2, 3, \dots$$

and the array factor has at least one maximum along $\theta=0$. [6]

c) For a 19 element uniform linear scanning array with a spacing of $\lambda/4$ between elements, determine the progressive phase excitation between the elements so that the maximum of the array factor is 30 degree from the array axis. What is the HPBW of the AF? What is the value (in dB) of the maximum of the first minor lobe [8]

4. a) Derive the expression for directivity of an N element uniform end fire array. [8]

b) Three isotropic elements of equal excitation phase are placed along the Y axis as shown below. If the relative amplitude of #1 is +2 and #2 and #3 is +1, find the expression for three dimensional un-normalised array factor. Also determine the nulls and maxima of the AF. [8]



c) What are grating lobes in uniform linear arrays? Explain how these can be eliminated while designing arrays. [4]

5. a) Design a broadside binomial array of 6 elements placed along the z axis separated by a distance $d = \lambda/2$. Find the amplitude excitation coefficients. What are the progressive phase shift between elements? What is the array factor (AF)? [8]

b) Explain why a log-periodic antenna is frequency independent. Describe the mechanism of radiation from a log periodic array. Also obtain the relation between the highest and lowest frequency of operation of a log periodic array [2+3+3=8]

c) The impedance of a folded dipole is four times greater than that of an isolated dipole-Justify. [4]

6. a) What are reflector, director and driven element in an Yagi Uda array? What are the typical dimensions of a Yagi-Uda array? Why are directors shorter in length compared to driven element? Why is the spacing of directors critical to the design of the array? Which factors control the directivity of the array? Explain [4+2+4+3+3=16]

b) Which factors affect the directivity of a Horn antenna? Explain [4]

Enrolment No. 15UEC060

S₆(UEC06B19)ECE

B.Tech 6th Semester End-Term Examination, 2018
Advanced Microprocessor and Computer Architecture
UEC06B19

Full Marks: 100

Time: 3 hours

Answer Section A and Section B separately on same answer script

Section-A

A1) Answer any 5 questions

[5X2=10]

A1-i) Explain the power save/ Power down feature of 80186.

A1-ii) Write the functions of the following pins with respect to 80186: ARDY and BHE

A1-iii) Explain the machine status word register of 80286.

A1-iv) Explain how 80286 generate 16MB physical memory and 1GB virtual address.

A1-v) Write the function of test and debug register present in 80386?

A1-vi) Write the functions of parity checker/generator used in 80486.

A2) Answer any 5 questions

[5X4=20]

A2-i) Explain the peripheral control block status based on following program segment:

MOV DX, 0FFFFH MOX AX, F200 H.

MOV F200 H

OUT DX, AX

A2-ii) Explain how interrupt controller of 80186 works in master mode and slave mode.

A2-iii) Explain the real address mode of 80286.

A2-iv) Define the purpose of each of the control registers found within the 80386.

A2-v) Write the steps executed by 80386 to switch from real mode to protected mode.

A2-vi) Write the functions of following pins of 80486:

- (a) KEN (b) FERR (c) FLUSH (d) IGNNE

A3) Answer any 4 questions

[4X5=20]

A3-i) What differences exist in the flags of the 80386 when compared to the 80186 microprocessor?

A3-ii) Explain with a suitable example, the memory paging mechanism using page table directory entry of 80386.

A3-iii) Explain the descriptors of 80286 and 80386 microprocessor.

A3-iv) Explain the special feature 'BIST' found in 80486 and higher microprocessors. Write the difference between (a) write-through cache memory (b) write-around cache memory (c) write-back cache memory.

A3-v) Explain the Timer Control Register (TCR) of Timer₀ and Timer₁ of 80186.

Section-BAnswer Question B1 and any two from the rest

(40)
(20)
(10)

ECE

- ~~B1~~) Find the number of cycles required to execute the following set of instructions using Tomasulo's algorithm in case of i) non-pipelined machine, ii) non-pipelined machine with data bypassing, iii) out-of-order dispatch pipelined machine . (Cycle by cycle explanation required)

MUL R3 \leftarrow R1, R2
 ADD R5 \leftarrow R3, R4
 ADD R7 \leftarrow R2, R6
 ADD R10 \leftarrow R8, R9
 MUL R11 \leftarrow R7, R10
 ADD R5 \leftarrow R5, R11

[Assume ADD takes 4 cycles and MUL takes 6 cycles]
 [The pipeline stages are F-D-E-W]

ole.

20

- ~~B2~~) i) Explain the following methods for reducing cache conflict misses: Victim cache, Hashed indexed functions, Pseudo associativity and Skewed associative cache. ii) Write and explain the fundamental ways of handling flow dependencies. iii) What are the advantages and disadvantages of Fine-Grained Multithreading w.r.t. control dependency handling?

7+4+4=15

3]

5+10=15

]

]

If

- ~~B3~~) i) What is delayed branching-explain and write its advantages and disadvantages. ii) Discuss various static and dynamic branch prediction techniques.

5+10=15

- ~~B4~~) i) Show an implementation of the following operation using a single processor and 3 parallel processors: $a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$. Also calculate the speed up. ii) State Amdahl's law. iii) With a suitable example, differentiate between Array processors and Vector processors.

8+2+5=15

Full Marks: 100

Time: 3hrs

The figure in the margins indicates full marks for the questions.

Candidates are required to give their answers in their own words as far as practicable.

Each notation has its usual meaning.

Attempt all questions

1. (a) Determine whether $j^{\frac{n}{4}}$ is an energy or power signal or neither. [3]
- (b) Determine the z transform and ROC of the signal $x(n)=u(n)-u(n-10)$. [3]
- (c) State the difference between fixed and floating point number representation. [2]
- (d) Determine whether the signal $x(n) = \sum_{k=-\infty}^{\infty} (-1)^k \delta(n-2k)$ is periodic or not. If periodic then find out the fundamental time period. [3]
- (e) If the Nyquist rate for $x(t)$ is Ω_s then find the Nyquist rate for $x(\frac{t}{3})$. [3]
- (f) Find the inverse Discrete Time Fourier Transform of
- $$X(e^{jw}) = \sum_{m=-\infty}^{\infty} 2\pi\delta(\omega - \omega_0 - 2\pi m). [5]$$
- (g) Define impulse response of a system. [1]

2. (a) Find the inverse z- transform of $X(z) = \frac{1 - z^{-1} + z^{-2}}{(1 - \frac{1}{2}z^{-1})(1 - 2z^{-1})(1 - z^{-1})}$ with ROC $1 < |z| < 2$. [8]
- (b) State and prove the Initial Value Theorem.

OR

- (b) A discrete time system is characterized by the difference equation $y(n) - \frac{1}{2}y(n-1) = x(n) - \frac{1}{2}x(n-1)$. Find $y(n)$ for $n \geq 0$ when $x(n) = u(n)$ and the initial condition is given as $y(-1) = 1$. [4]
- (c) Determine the auto correlation sequence of the signal using z-transform $x(n) = a^n u(n)$, $-1 < a < 1$. [8]

3. (a) Let $x(n)$ be a 4-point sequence $x(n) = \{1, 1, 1, 1\}$. Compute the 4-point DFT of $x(n)$ and sketch the magnitude and phase plot. [8]

(b) Find the 4-point circular convolution of $x(n)$ and $h(n)$ given by $x(n) = \{1, 1, 1, 1\}$ and $h(n) = \{1, 0, 1, 0\}$ using Radix 2 DIF FFT algorithm. [12]

4. (a) Obtain the cascade form realization structure for the system function

$$H(z) = \frac{1 + \frac{1}{4}z^{-1}}{(1 + \frac{1}{2}z^{-1})(1 + \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2})}$$

OR

(a) Obtain the Direct form II realization structure for the following system
 $y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.25x(n-2)$ [8]

(b) Enumerate the differences between FIR and IIR filters. [5]

(c) Derive the conditions for a filter to have linear phase response. [7]

5. (a) Perform the circular convolution of the following two sequences using Graphical method

$$x_1(n) = \{4, 5, 6\} \text{ and } x_2(n) = \{2, 3, 0, 1\}. [8]$$

(b) Let $x(n) = n+1$, $0 \leq n \leq 9$ and $h(n) = \{1, 0, -1\}$. Implement the overlap-add method to compute $x(n) * h(n)$.

OR

(b) Let $x(n) = n+1$, $0 \leq n \leq 9$ and $h(n) = \{1, 0, -1\}$. Implement the overlap-save method to compute $x(n) * h(n)$. [10]

(c) If $x_1(n) = \{3, 2, A, 0, B\}$ is circularly even sequence then find A and B. [2]

Full Marks:100

The figures in the margin indicate full marks for the questions

Time: 3 hours

Question no.1 is compulsory and answer any 8 questions from the rest:

1. Answer all the questions: [2X10=20]
 a) What is meant by RTL view?
 b) What is functional specification?
 c) What should be the threshold voltage of enhancement nMOS transistor and why?
 d) What are the different types of photoresist?
 e) What is stick diagram?
 f) What are the goals of floorplanning?
 g) What is metallization?
 h) What is MOCVD?
 i) What is packaging?
 j) What is the importance of packaging?
2. a) How can you classify parasitic device capacitances based on their origins. Explain all the capacitances. [5]
 b) Why polysilicon is used for Gate of MOSFET? [5]
3. a) Derive an expression for V_{IH} as a function of the output voltage of the CMOS inverter and threshold voltage of the transistors. [5]
 b) Is there any possibility of leakage current when a logic value 1 is applied to the input of a circuit implemented in CMOS logic? Explain with a diagram to support your answer. [5]
4. a) Draw the stick diagram for two input NAND function. [5]
 b) What do you mean by Ion Stopping and Ion Channeling? What is done to remove the defects caused by ion implantation? [5]
5. a) NMOS transfers '0' perfectly. Justify the statement. [5]
 b) Is there any dependence of drain voltage in saturation region of a MOS transistor? Derive the current equation to support your answer. [5]
6. a) What are the different types of oxidation? Explain. [5]
 b) What is the purpose of Placement and Routing in Physical Design? [5]
7. a) Explain with the help of a circuit and proper calculations about how pipelining may be used to reduce the dynamic power dissipation. [6]
 b) Write the verilog code for the following decoder realization, $f_1(x_2, x_1, x_0) = \sum m(1, 2, 4, 5)$ and $f_2(x_2, x_1, x_0) = \sum m(1, 5, 7)$. [4]
8. a) Consider a CMOS inverter circuit with the following parameters: $V_{DD}=3.3V$, $V_{TO,n}=0.6V$, $V_{TO,p}=-0.7V$, $k_n=200 \mu A/V^2$, $k_p=80 \mu A/V^2$. Calculate the noise margins of the circuit. [6]
 b) Is there any possibility of dynamic power dissipation in CMOS circuits when the primary output of the inverter shows no transition? Explain with a circuit to support your answer. [4]
9. a) Show how the MOSFET parameters are scaled in a constant voltage scaling. [5]
 b) Design the following function using CMOS logic:

$$F = (AB + BC + CD)$$
10. a) Draw the VTC of the CMOS inverter and denote the different regions of operations. Also prove with equations to support the modes of operation of nMOS or pMOS in the different regions. [6]
 b) Design a full adder using 3X8 decoder and OR gate. Write the verilog code for it. [4]

B.Tech. 6th Semester End-Term Examination 2018
 Subject Name: Industrial Management
 Subject Code: UEC06C19

S₆(UEC06C19)ECE

Full Marks: 100

Time: 3 hours

Answer all Questions*The figures in the margin indicate full marks*

1. Define Management. Discuss various levels of management. (1+7=8)
2. What is Working Capital? Discuss various sources of working capital. (2+5=7)
3. Define Budget and Budgeting. Discuss the features of a Budget. (2+3=5)

A. A Co. is planning to produce 1,00,000 units of an article. The estimated cost of production is given below:

	Rs.
Direct Materials	30,00,000
Direct Labour	10,50,000
Power (20% fixed)	10,00,000
Repairs and maintenance (15% fixed)	8,00,000
Depreciation (40% variable)	6,00,000
Administrative expenses (100% fixed)	12,00,000

Prepare a Flexible Budget showing individual expenses of production levels at 1,50,000 units and 2,00,000 units. (10)

5. B2C Electronics Ltd has currently an equity share capital of Rs. 40,00,000, consisting of 400,000 equity shares of Rs 10 each. The management is planning to raise another Rs. 30,00,000 to finance a project through one of the three possible financing plans. The options are as follows:

- Entirely through equity share issues Rs. 10 each
- Rs.15,00,000 through equity share of Rs. 10 each and balance in 8% debentures.
- Rs.10,00,000 through equity share of Rs. 10 each and balance through 9% long term loan.

The Expected Earnings Before Interest and Tax (EBIT) of the Co. is Rs.15,00,000. Assuming corporate tax @ 30%, you are required to find out Earnings Per Share (EPS) and Financial leverage of the Co. in different plans and also comment on the options. (10)

6. From the following information of PVC Ltd., determine the Working Capital requirement:

i.	Annual (expected) sales	Rs.4,80,000	$\rightarrow 40,000$
ii.	Analysis of Sales:		
a.	Raw Materials	50 %	$\rightarrow 20,000$
b.	Expenses	30%	$\rightarrow 12,000$
c.	Profit	20%	$\rightarrow 8,000$
iii.	Credit allowed to Debtors	2 months	
iv.	Credit allowed by Creditors	1 month	
v.	Raw Materials in store	1 month	
vi.	Processing Period	2 months	
vii.	Finished Goods in store	4 months	
viii.	Bank Overdraft	Rs.50,000	
ix.	Cash in hand for contingencies	Rs.10,000	(10)

7. Discuss control of monopoly through (a) lumpsum tax (b) Specific tax.

Explain the features of monopolistic competition. Discuss classification of market on the basis of area. (5+3+2=10)

8. Distinguish between Selling cost and production cost. How do selling costs affect equilibrium of a firm operating under monopolistic competition? Discuss the long run equilibrium situation under monopolistic competition. (2+4+4=10)

9. Discuss the classification of oligopoly on the basis of collusion. Explain the characteristics of an oligopolistic market. Given the following demand and cost functions $P=250-3q$ and $C=3q+5q^2$ respectively, find the profit maximizing price and output. How would the firm adjust its price and output if a tax of Rs.4 per unit of output is imposed on the firm. (3+3+4=10)

10. What are different types of price leadership that may be established in oligopolistic market situation? Assuming that there are two firms producing homogeneous product explain how price and output are determined where there is price leadership by low cost firm. Discuss the types of price discrimination. (3+4+3=10)

11. What is cartel? Explain how a cartel determines price and output of a product to maximize joint profits. A monopolist faces two demand functions $p_1=12-q_1$ and $p_2=20-3q_2$ in two markets. Suppose his total cost function is given by $C=3+2(q_1+q_2)$. Determine the prices the monopolist will charge in two markets if his objective is to maximize profit. (2+4+4=10)

The figures in the margin indicate full marks for the questions
(Candidates are required to give their answers in their own words as far as practicable)

Attempt any Five

1. a) What are the general requirements of any radar system? 4
 b) What is the function of duplexer in any radar system? What is radar cross-sectional area? 4
 c) Draw the block diagram of CW Radar and explain its working briefly. 4
 d) What is sweep to sweep subtraction and delay line canceller? 6
2. a) With the help of neat diagrams explain the operating principle of a TUNNEL diode. 7
 b) For a two cavity klystron amplifier show that the distance from the buncher grid to the location of dense electron bunching for the electrons is 15% lesser than the optimum distance between them. 10
- OR
- a) Explain different operating modes of a Gunn Diode. 5
 b) A marine radar operating at 10 GHz has a maximum range of 50 Km with an antenna gain of 4000. If the transmitter has a power of 250 KW and a minimum detectable signal of 10^{-11} W. Determine the cross section of the target the radar can sight. 3
- c) A rectangular air-filled copper waveguide with a 0.9inch×0.4inch cross section and 12 inch length is operated at 9.2 GHz with a dominant mode. Find i) cut-off frequency ii) guide wavelength iii) phase velocity iv) characteristic impedance 5
- d) Derive the expression of resonant frequency in a rectangular cavity resonator which is filled with air medium. 5
- e) Find the resonant frequencies of the first five lowest modes of an air-filled rectangular cavity resonator of dimensions 5cm×4cm×2.5cm. List them in ascending order. 5
- f) Briefly explain the operation of rat-race circuit with s-matrix. 5
4. a) With the help of relevant diagrams explain the operating principle of Gunn diode and its I-V characteristics. 5
 b) Explain quenched domain mode, transit time mode and delayed domain mode 6
 c) With the aid of schematic diagram, describe the construction of travelling wave tube. 5
 d) Explain the operation of a multi-cavity klystron. 4

~~Q1~~ Explain the operation of a four-port microwave circulator using two magic tee junctions. 5

~~Q2~~ Describe an ideal Directional coupler. Define Coupling factor and Directivity in context of a directional coupler. 5

~~Q3~~ Explain, with a neat schematic diagram, the construction and operation of Reflex Klystron. 5

~~Q4~~ What is second time around echoes in case of target detection in a radar system? Find the expression of Doppler frequency in case of a moving target and also point out the condition when Doppler shift is maximum and minimum. 5

~~Q5(a)~~ What is the requirement of S-matrix for high frequency circuit analysis? Formulate S-matrix for a n-line transmission line considering high frequency application. 5

~~Q5(b)~~ i) For a rectangular waveguide show that square root of multiplication of characteristic impedance for TE and TM mode becomes equivalent to free space wave impedance. *operating freq = 3GHz* (3+3)

~~Q5(ii)~~ ii) Calculate Z_{TE10} for an air-filled waveguide of inside dimensions $22.9\text{mm} \times 10.2\text{mm}$ in terms of free space impedance η .

~~Q6(e)~~ Discuss the significance of critical frequency and dominant mode in waveguide transmission. 4

~~Q6(f)~~ Why reentrant cavities are used in klystron amplifiers? Derive the expression of resonant frequency of a coaxial reentrant cavity resonator. 5

~~Q7~~ Write short note: (any two) 10×2

- Pulsed RADAR
- CCD
- Isolator

B.Tech 6th Semester Mid-term Examination, 2018

Name of Subject: DSP

Branch: ECE

Paper Code: UEC06B17

Full Marks: 50

Time: 2hrs

The figure in the margins indicates full marks for the questions.
 Candidates are required to give their answers in their own words as far as practicable.
Each notation has its usual meaning.

Attempt all questions

1) Find the even and odd component of the sequence given below and sketch it
 $x[n] = \{4, -2, 4, -6\}$. [2]

2) Determine if the signal is periodic or not if periodic find the fundamental period
 $x[n] = (-1)^n$. [3]

3) Find if $y[n] = \sum_{k=-\infty}^{2n} x(k)$ is linear, time invariant, causal and stable. [4]

4) Find the autocorrelation function for $x[n] = \left(\frac{1}{2}\right)^n u[n]$. [3]

5) Find the step response for the LTI system represented by the following impulse response:

$$h[n] = \begin{cases} (0.8)^n; & n \geq -2 \\ 0; & n < -2 \end{cases} [3]$$

6) Determine the cross correlation of the sequences $x_1[n] = \{1, 2, 3, 4\}$ and $x_2[n] = \{4, 3, 2, 1\}$ using z transform. [3]

Or

Using multiplication method find the convolution of $x(n) = \{4, 5, 6\}$ and $h(n) = \{4, 4, 3, 2\}$ [3]

7) Define ROC. [1]

8) Differentiate between energy and power signal with appropriate equations and determine whether $x(n) = u(n)$ is an energy signal or a power signal or neither. [2+2]

9) Explain the first order hold reconstruction technique. [2]

10) Explain Aliasing. [2]

11) Explain the Flat-Top Sampling technique. [3]

12) Determine the z-transform of the following signals and depict their ROC and location of poles and zeroes in the z-plane : [3]

i) $x(n) = x[n] = \sin(\omega_0 n)u[n]$

ii) $x(n) = \{1, 2, 6, -2, 0, 3\}$

[3+3]

13) Determine the Z-transform of

c) $x(n) = 2 \delta(n+2) + 3\delta(n) - 5\delta(n-1) + 3 \delta(n-2)$ using time shifting property

ii) $x(n) = a^{\frac{n}{3}} u\left(\frac{n}{3}\right) = \begin{cases} a^{\frac{n}{3}}, & n = 0, 3, 6, \dots \\ 0, & \text{elsewhere} \end{cases}$ using time expansion property,

where $|a| < 1$

iii) $g(n) = |n|a^{|n|}$ using differentiation property.

[2+4+4]

14) Let $x[n] = e^{-\frac{n}{2}} u[n]$. Find $w(n) = 2x(5n/3)$. Assume $x[n]=0$ if n is not an integer. [2]

15) Explain downsampling operation. [2]

6B1

? ho

[5 x

lock

cati

B.Tech 6th Semester Mid-Term Examination, 2018
 Advanced Microprocessor and Computer Architecture
 UEC06B19

Full Marks: 50

Time: 2 hours

Answer Section A and Section B separately on same answer script

Section-A

Answer question no. A-1 and any three from the rest (A-2 to A-5). [5 x 2 = 10]

~~A-1~~ (i) Explain the function of relocation register present in the 80186 peripheral control block?~~(ii)~~ Explain the power save / power down feature of 80186 micro-processor.~~(iii)~~ Explain the BOUND and SINGLE STEP interrupts?~~(iv)~~ What are the function of RFSH and BHE control signal in 80186 micro-processor?~~(v)~~ Explain the End-of-Interrupt (EOI) register of 80186 micro-processor.~~A-2~~ (i) Explain the DMA controller and its associated control register of 80186. [4+1]~~(ii)~~ Write the software required to move the peripheral control block to input-output locations C1000H-C10FFH with no escape trap in master mode.~~A-3~~ (i) Explain how to generate continuous pulses with 20% duty cycle using Timer1? [2+3]~~(ii)~~ Explain the Timer Control Register (TCR) of Timer₀ and Timer₁ of 80186.~~A-4~~ (i) What is the difference between the interrupt poll and interrupt poll status registers? [2+3]~~(ii)~~ Explain with block diagram the Programmable Interrupt controller of 80186.~~A-5~~ (i) Write the functions of BOUND and Unused Opcode interrupt of 80186. [2+3]~~(ii)~~ Write the functions of following pins of 80186:(a) S₂, S₁ and S₀ (b) ARDY and SRDY (c) A₁₆, A₁₇, A₁₈, A₁₉/ ONCESection-B

Answer question no. B-5 and any three from the rest (B-1 to B-4).

~~B-1~~ State the differences between a Von Neumann machine and a Data Flow machine. [5]~~B-2~~ What are the advantages and disadvantages of complex instructions? [5]~~B-3~~ With a suitable diagram, explain the working principle of an SRAM and a DRAM. [5]~~B-4~~ Explain LRU policy and Victim-Non Victim policy. [5]~~B-5~~ Explain Direct mapped, Set Associative and Fully Associative cache memories. [10]

B.TECH, 6th SEMESTER, MID TERM EXAMINATION, 2018Name of Subject: Microwave Engineering and Radar
Code No: - UEC06B16

Full Marks: 50

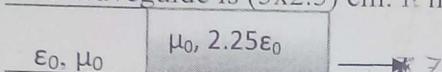
Times: 2Hrs.

The figures in the margin indicate full marks for the questions
(Candidates are required to give their answers in their own words as far as practicable)Attempt all

1. With the relevant diagram describe the operating principle of E plane and H plane Tee. Derive the Scattering matrix of Series Tee junction for the following cases :

Two collinear/coplanar ports are matched
Series arm is matched

2. a) The cross section of a waveguide is (5×2.5) cm. It has a dielectric discontinuity as shown in figure.



If the guide operate at 8GHz in the dominant mode find out the standing wave ratio.

- b) A (6×4) cm rectangular waveguide is filled with dielectric of refractive index of 1.25. Find out the range of frequencies over which guide support both TE_{10} and TE_{01} modes and no other modes.

- c) An (8×10) cm air filled waveguide operates in TE mode at 4 GHz. Find out the number of TE and TM modes that can be propagated through the waveguide.

3. a) What is degenerate mode and dominant mode? (5)

- b) Draw the electric and magnetic field pattern inside the rectangular wave guide of TE_{10} , TE_{20} and TE_{11} (both from side and front view). (5)

- c) Considering both time and space varying sinusoidal signal which is propagating along the +Z direction is fed in the waveguide having dimension $(a \times b)$ and H-field along the direction of propagation is zero. Therefore from Helmholtz wave equation find out different possible field components exist in different axis. Prove that for the aforementioned waveguide mode number (m & n) should be non-zero quantity for the dominant mode. (10)

$$E_{yz} = -\frac{\partial}{h^2} \frac{\partial E_z}{\partial y} + \frac{j\omega\mu}{h^2} \frac{\partial H_z}{\partial y}$$

$-j\omega\epsilon \frac{\partial E_z}{\partial z}$

Enrolment No. 15UEC060

S6(UEC06B18)EC

B.Tech 6th Semester : Midterm Examination, Feb 2018

Name of subject: VLSI Engineering

Paper code: UEC06B18

Full Marks: 50

Time: 2 hours

The figures in the margin indicate full marks for the questions.

Answer any five questions

(5 X 10=50)

[Q1]

- a) What is the sequence of steps followed to translate the idea of a system [5] into a chip. Explain all the steps.
- b) Compare the different VLSI design styles. [2]
- c) Discuss the different types of PLDs. [3]

[Q2]

- a) Derive the I/V characteristics of an n-channel enhancement type [6] MOSFET.
- b) Determine the channel resistance in the deep triode region. [4]

[Q3]

- a) Describe any two techniques of crystal growth with diagrams. [5]
- b) What is Photolithography and what are the components of this [2] process.
- c) Explain all the exposure techniques with diagrams. [3]

[Q4]

- a) Determine the expression for transconductance at saturation region. [3+2]
Hence plot the graph for transconductance and overdrive voltage.
- b) Analytically show how the drain current is affected by the drain to [5] source potential at the saturation region.

[Q5]

- a) How can you distinguish between Ion implantation and Diffusion? [4]
- b) What is the need of Epitaxial growth? Explain MBE and PVD system. [6]

[Q6]

- a) Write the verilog code for the following decoder realization, [5]
 $f_1(x_2, x_1, x_0) = \sum m(1, 2, 4, 5)$ and $f_2(x_2, x_1, x_0) = \sum m(1, 5, 7)$.
- b) Write a verilog code to realize a 4:1 MUX using 2:1 MUX. [5]

Enrolment No. 15UEC060

B.Tech. 6th Semester Mid Term Examination 2018
Subject Name: Industrial Management
Subject Code: UEC06C15

S₆(UEC06C15)EC

Full marks: 50

Time: 2 Hours

Answer all questions.

1. Explain Industrial management. (3)
2. Discuss the behavior of Fixed cost and variable cost in respect of volume of output with suitable diagram. (5)
3. Write short notes on (any two) : (i) Capital Structure (ii) Dividends (iii) Public Sector Undertaking(PSU) (iv) Equity share (2+2=4)
4. Following are the information of a manufacturing Company:
- Sales volume 40,000 units.
- Selling price per unit Rs.20.
- Variable cost per unit Rs.10.
- Fixed cost Rs.2,00,000.
- Calculate i) Profit-volume Ratio ii) Break-even point (in unit and in value) iii) Profit when sales value is Rs.12,00,000 iv) Margin of Safety (4×2=8)
5. Explain the various factors that determine the extent of the market. Discuss the classification of market on the basis of degree of competition. (4+2=6)
6. What are the conditions of equilibrium of a firm in perfect competition? Define monopoly. (2+2=4)
7. Discuss the various features of perfect competition. What is the shape of MR Curve in perfect competition? (3+2=5)
8. Discuss the short run equilibrium situation of a firm under perfect competition. (5)
9. Explain the long run equilibrium under monopoly. Define price discrimination. Discuss the types of price discrimination. What is the shape of AR Curve in monopoly? (4+2+2+2=10)
