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Department of Computer Systems Engineering
University of Engineering & Technology, Peshawar

Operating System

Midterm Exam, Spring 2022

Maximum Time Allowed: 2 Hours **Maximum Weightage: 20%**

- Be precise and concise in your answers. Attempt all questions on the question paper in the provided space
- Please indent and comment your code properly. Un-indented/commented code will not be checked
- Cell phone/tablets/calculators not allowed

Q1. Please check the following statements and fix if you see issues. If no issue, say the statement is correct.

A. Parent process does not share file descriptor table with its child process.

B. Stack memory stores local variables, return addresses and program argument array.

C. Threads share process id, program counter and cpu registers.

D. A thread still lives if the thread that created it exits / terminates.

E. Every process has its own PCB, which is stored in its memory image.

Q2. Briefly define the following terms.

A. System Call. B. Pthread Library C. Program Counter. D. Dispatcher. E. Scheduler. F. Data Parallelism. G. Task Parallelism. H. User Mode. I. Kernel Mode. J. Memory image / Footprint.

Q3. What is a thread. Describe the relationship between a user level and kernel level thread.

Q4. Write a C program that creates 10 child processes. Each child process generate 1000 random numbers between 1 and 50.

University of Engineering & Technology, Peshawar

Department: Computer Systems Engineering

Semester: 4th Semester

Allowed Time: 120 Minutes

Paper: Probability Methods in Engineering

Exam Type: Final term

Total Marks: 60

Instructions:

1- This exam is CLOSED books/notes/Internet.
2- Sharing of books, notes and other materials during this exam is not permitted.
3- There are 4 problems in total. Some problems are harder than others. Answer the easy ones first to maximize your score.
4- Problems will not be interpreted during the exam.

Answer All Questions

Q1: Part A: In a bolt factory, three machines M_1, M_2, and M_3 manufacture 2000, 2500, and 4000 bolts every day. Of their output 3%, 4%, and 2.5% are defective bolts. One of the bolts is drawn very randomly from a day's production and is found to be defective. What is the probability that it was produced by machine M_2? **(Marks 7)**

Q1: Part B: The results of a survey of a group of 100 people having insurances with a certain company are as follows: 40% have both home and car insurances with the company. The probability that person selected at random from this group, has a car insurance is 0.7. What is the probability that a person selected at random has a home insurance knowing that he has a car insurance? **(Marks 7)]**

$p = 0.4 \quad q = 0.6$

Q2: Part A: Let X denote a discrete random variable that can take the values {–1, M, 1}. Given that X has probability distribution function $f(x) = \frac{x+2}{6}$, find the expected value of X. **(Marks 7)**

Q2: Part B: Show that the expected value of the binomial random variable is np. **(Marks 7)**

Q3: Part A: Find the variance of the geometric random variable. **(Marks 7)**

Q3: Part B: Let X be a discrete random variable Rx = {1,2} having support and probability mass function is given as

$p \quad q^{x-p}$ (18)

$$p_X(x) = \begin{cases} 3/4 & \text{if } x = 1 \\ 1/4 & \text{if } x = 2 \\ 0 & \text{otherwise} \end{cases}$$

Find the third central moment of X using moment theorem. **(Marks 7)**

Q4: Part A: A customer help center receives on average 3.5 calls every hour. **(Marks 7)**

a. What is the probability that it will receive at most 4 calls every hour?

b. What is the probability that it will receive at least 5 calls every hour?

Q4: Part B: Your attendance in your Probability Methods in Engineering (PME) class can be modeled as a Markov process. When you go to class, you understand the material well and there is a 90% chance that you will go to the next class. However when you skip class, you become discouraged and so there is only a 60% chance that you'll go to the next class. Suppose that you attend the first day of class. Determine **(Marks 5)**

1. *Transition probability* matrix.
2. *State-transition diagram* for this problem.

Q4: Part C: Let V be the voltage of a signal in S_V having possible values 1, 2 and 3 with $p_V(k)$ as 1/4, 1/2 and 1/4 respectively. Find the mean power E[P] of the signal where $P = V^2$ and $R = 1$. Find E[Z] where $Z = (V+1)^3$. **(Marks 6)**

Electronic Circuits Midterm Exam Spring 2022

Q1. CLO1 {C2 (Comprehension)} (Marks 20)

Reply in one or two lines, to each of the following questions

a. What are Intrinsic semiconductors?
b. Why do semiconductor materials have Negative Temperature Coefficient (NTC)?
c. Define Doping.
d. How is a P-type extrinsic semiconductor formed?
e. What are intrinsic careers and how are they created?
f. Give the most important characteristic of GaAs semiconductor.
g. Why is Si less sensitive to temperature variation than Ge, in their electrical characteristics?
h. How is a Donor Ion formed?
i. What is depletion region in a semiconductor diode?
j. Briefly describe one phenomenon that causes reverse breakdown in a diode.

Q2. Find the dynamic resistance of a diode by differentiating the Shockley's equation. (Marks 10)

Q3. CLO3 {C5 (Synthesis)} (Marks 20)

Figure 1 shows the output of a full wave bridge rectifier. Design a circuit that would produce this output when the input is a sinusoidal signal of 10 V amplitude (Consider using different semiconductor diodes).

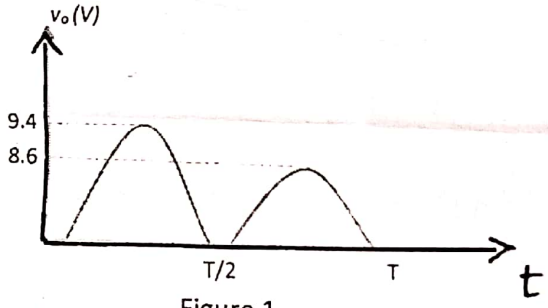

Figure 1

Q4. In the circuit of Figure 2, V_m =10 Volts and V= 3 Volts. Draw the output waveform using a step by step procedure. (Marks 20)

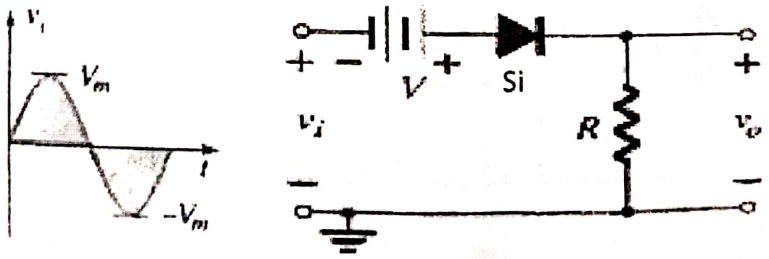

Figure 2

End

Electronic Circuits

Final Exam Spring 2022

Q1. Determine I, V_1, and V_2 for the series dc configuration of Fig. 1 (Marks 15)

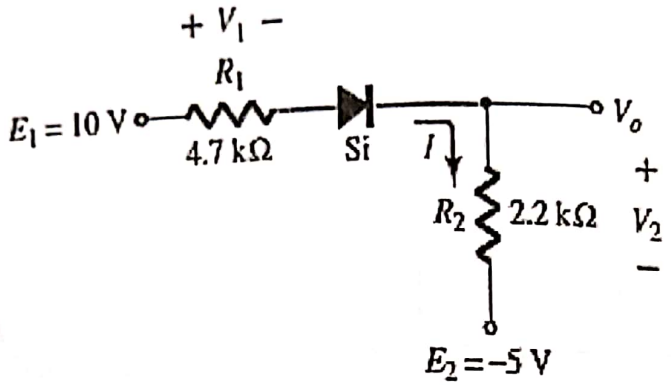

Figure 1

Q2. (Marks 20)

Determine the range of values of V_i that will maintain the Zener diode of Fig. 2 in the "on" state.

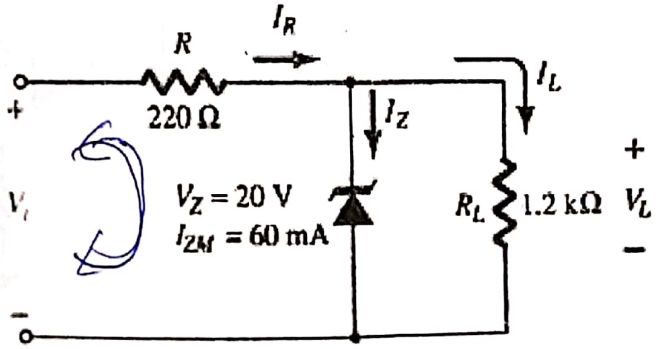

Figure 2

Q3. (Marks 10)

Using the characteristics of Fig. 3, Find the value of I_C corresponding to V_{BE} =+750 mV and V_{CE} =+4 V.

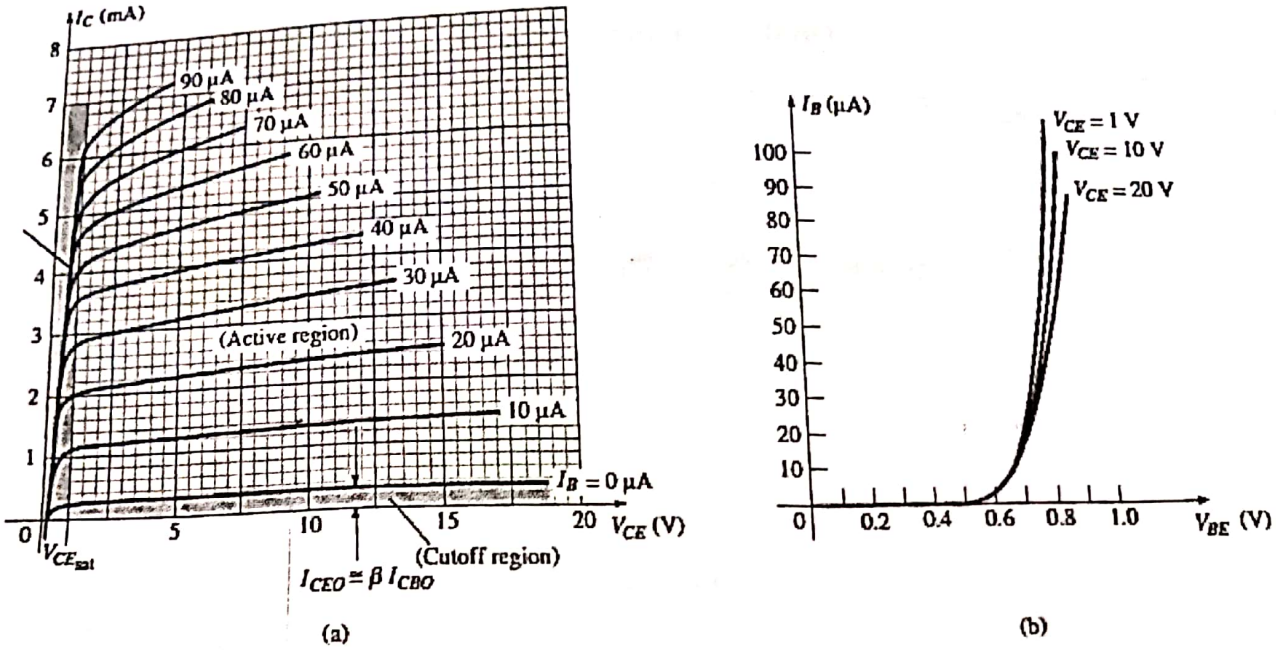

Figure 3

Q4. (Marks 20)

Given the information provided in Fig. 4, determine:

1. R_C.
2. R_E.
3. R_B.
4. V_{CE}.
5. V_B.

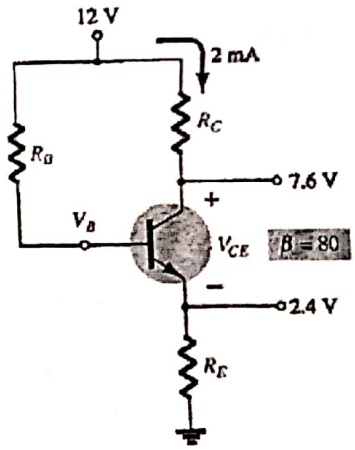

Figure 4

Q5. (Marks 15)

For a CE- Emitter Bias Configuration (Un-bypassed case), draw the AC equivalent circuit with transistor r_e model and derive equations for the following quantities:

1) $Z_{i.}$, 2) Z_o. 3) A_v

$Z_i = R_B \| \beta r_e$

$Z_o = R_o \| r_c$

$A_V = \frac{R_o \| r_c}{\beta r_e}$

Q6. (Marks 20)

a) Show the basic construction of a Depletion Type MOSFET transistor

b) Draw the circuit for a CMOS inverter

END

Department of Computer Systems Engineering
University of Engineering & Technology
Peshawar, PAKISTAN

Subject: Signal and Systems (4th Semester)

Exam: Final Term (Spring 2022)

Max Marks: 20

Time allowed: 2 Hours

Attempt all questions

(CLO_2)

Question_1:

1) State the commutative, associative and distributive properties of convolution sum. How these properties are applied to find the overall response of the combination of LTI systems connected in, **(2 Marks)**

   i) Parallel

   ii) Series

2) *Use the convolution sum to find the response y[n] of an LTI system with impulse response h[n] when the signal x[n] is passed through it;* where h[n] and x[n] are given by,**(4 Marks)**

$$h[n] = \left[\frac{1}{2}\right]^n u[n]$$

$$x[n] = \left[\frac{1}{3}\right]^n u[n]$$

Is the LTI system h[n] given above (a) causal (b) stable? Explain your answer.

(CLO_3)

Question_2:

1) State and explain the following properties of the continuous-time Fourier Series.**(2 Marks)**

   iii) Time shifting property

   iv) Conjugation and conjugate symmetry property

2) Compute and sketch the magnitude and phase spectrums of the discrete time periodic signal x[n] given in Figure_1. **(2+1.5+0.5 Marks)**

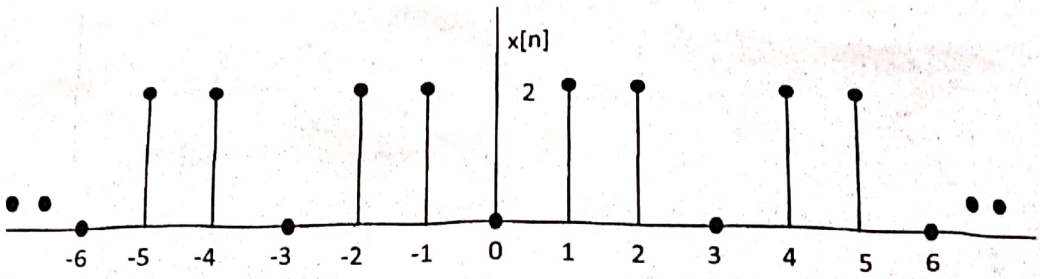

Figure 1

Discuss the periodicity and symmetry of the spectrums obtained.

Question_3: (CLO_4)

1) *If the Fourier Transform of a continuous-time signal x(t) is X(w), find the Fourier Transform of the following signals in terms of X(w), using the properties of continuous-time Fourier Transform. State the properties used in each step.* **(2 Marks)**

   a) $x_1(t) = 2x(-2t+2)$

   b) $x_2(t) = x(t-1)*x(1-t)$

2) Find the impulse response h[n] of the system described by the following difference equation. Is it an LTI system? If yes, how? Reason if No? **(3+3 Marks)**

$$2y[n] - y[n-1] = 2x[n]$$

Find the output $y[n]$ if the signal $x[n]$ given bellow is passed through this system.

$$x[n] = \left[\frac{1}{3}\right]^n u[n]$$

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Subject: Signal and Systems (4th Semester)

Exam: Mid Term (Spring 2022)

Max Marks: 25

Attempt All Questions. **Time allowed : 2 hours**

Question 1:

1) For the continues time signal x(t) and discrete-time signal x[n] given in Figure-1 below; find and sketch the following signals. (CLO1) **(4 Marks)**

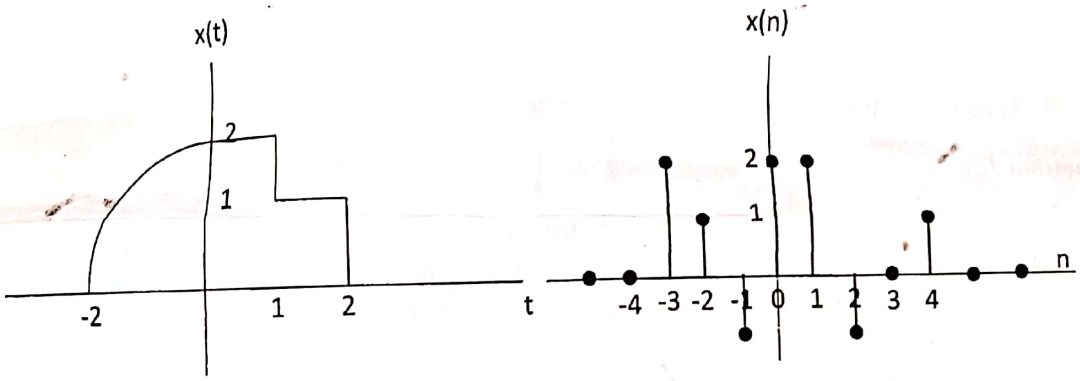

Figure-1

a) $x(-2t+2)$
b) $-2x(-\frac{1}{2}t+2)$
c) $x[2n-2]$
d) $2x[-\frac{1}{2}n+1]$

2) What are even and odd signals? Can a signal be neither odd nor even? Can a signal be even and odd at the same time? (CLO1) **(2 Marks)**

3) Find and sketch the even and odd parts of the continues time signal x(t) and discrete-time signal x[n] given in Figure-2 below. (CLO1) **(4 Marks)**

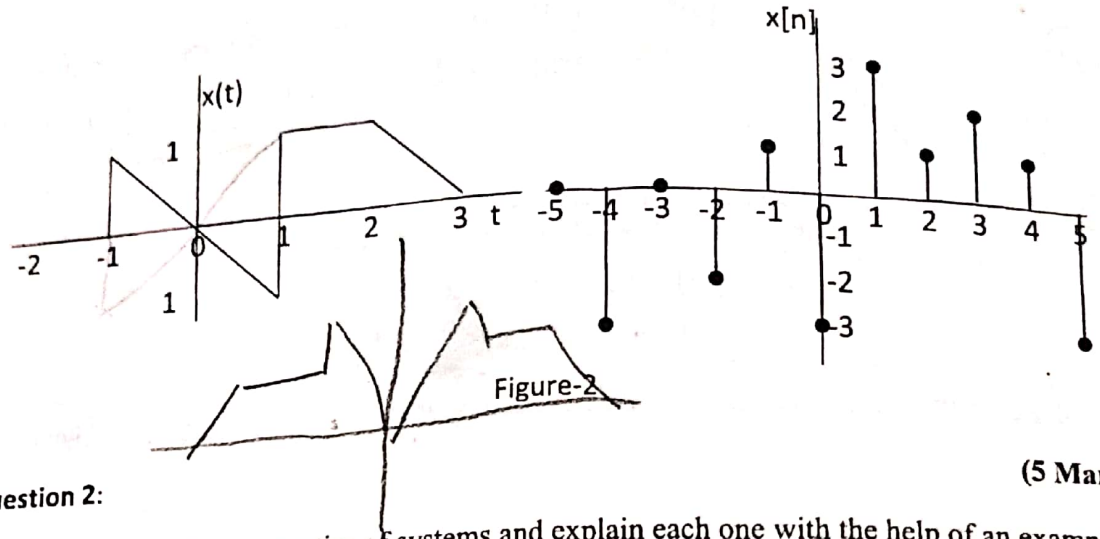

Figure-2

Question 2: **(5 Marks)**

1) State the following properties of systems and explain each one with the help of an example?
   a) System with memory vs system without memory
   b) Causal vs non-causal systems
   c) Invertible vs non-invertible systems
   d) Linear vs non-linear system
   e) Time-invariant system vs time-variant system

Question 3:

1) Use the convolution sum/integral to find the outputs for the following pairs of signals and LTI systems (continuous time system h(t) and discrete time system h[n]) given below in Figure-3. Also sketch the output signals y(t)/y[n]. (CLO2) **(5+5 Marks)**

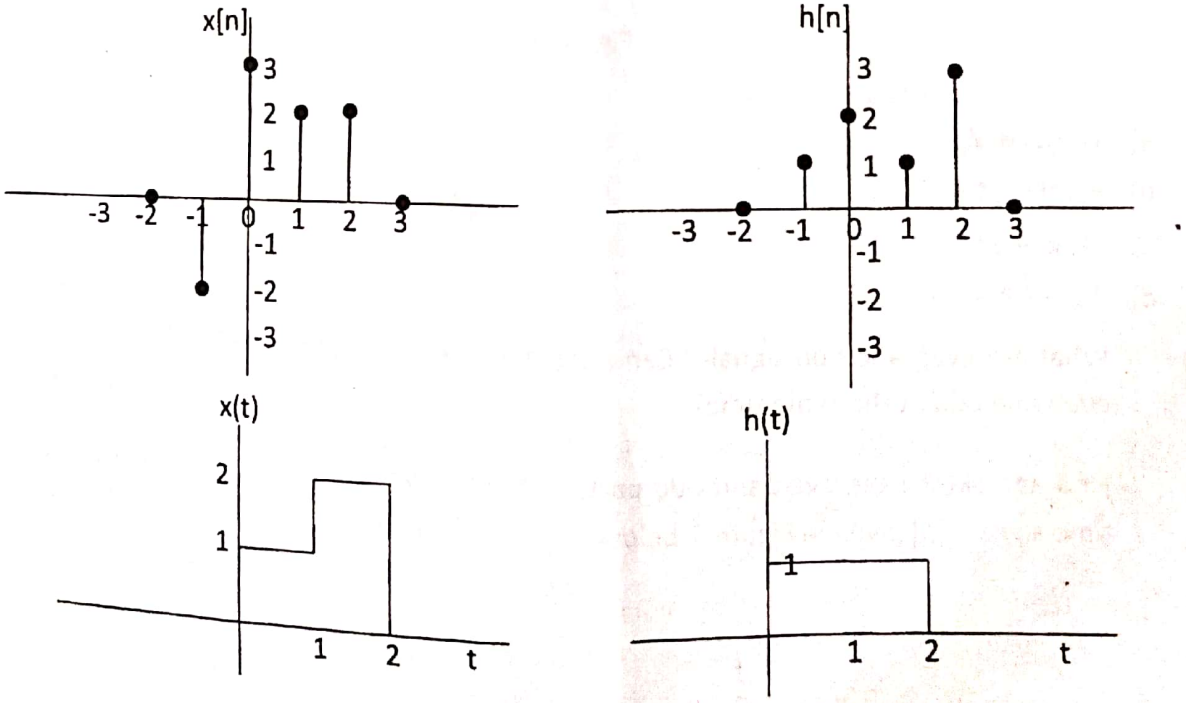

Figure 3