

Indian Institute of Information Technology Ranchi

Department of ECE/CSE

B. Tech Mid Semester Examination – Spring Semester 2022-23

Semester: IV

Branch: ECE/CSE/ECE(ES&IoT)/CSE(DS&AI)

Course Code: ES 2002

Course Title: Environmental Science and Green Technology

QUESTION PAPER

Duration: 2 hrs.

Max Marks: 60

Instructions:

- (1) Answer all questions. Number in [] indicates marks.
 (2) Any missing data can be assumed suitably.

1	(a)	Discuss the significance of environmental education	[5]
	(b)	Describe how the human life is dependent on environment	[5]
	(c)	Outline the key indicators of water quality	[5]
	(d)	Discuss the various steps of water quality monitoring process	[5]
2	(a)	Compare between slow sand filter and rapid sand filter	[6]
	(b)	List the major types of water pollutants and describe any ONE in detail	[4]
	(c)	Write short notes on any FOUR (i) Ecosystem (ii) Global warming (iii) Ozone depletion (iv) Acid rain (v) Greenhouse gases (vi) Carbon cycle	[10]
3	(a)	Discuss the various disinfection/sterilization methods of water treatment	[10]
	(b)	Define air pollution. Describe the various types of air pollutants, their sources and detrimental effects on human life and environment. Propose a few methods by which air pollution can be minimized.	[10]

End

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Indian Institute of Information Technology Ranchi

Department of Electronics and Communication Engineering
B. Tech Mid Semester Examination – Autumn Semester 2022-23

Semester: IV

Branch: ECE/CSE/ECE(ES&IoT)

Course Code: EC-2006/EI-2006

Course Name: Signal and Systems

QUESTION PAPER

Duration: 2 hrs.

Max Marks: 60

Instructions:

- (1) Answer all the questions. Number in [] indicates marks.
- (2) Scientific calculator is allowed in the examination.
- (3) Any missing data can be assumed suitably.
- (4) All symbol has their usual meaning.

- 1 (a) Express the signal $x(t)$ shown in figure 1 in terms of unit step functions. [3]

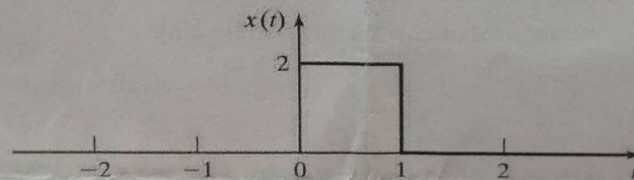


Figure 1: Signal $x(t)$.

- (b) Calculate its derivative and sketch it. [3+3]

- 2 A continuous-time signal is shown in figure 2. Sketch each of the following signal.

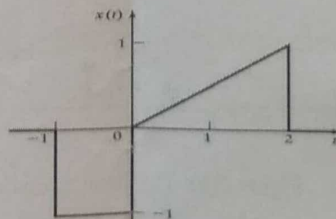


Figure 2: Signal $x(t)$.

- (a) $y(t) = x(-2t + 3)$ [5]

- (b) $y(t) = 3x(t) - 1$ [5]

- 3 (a) Check whether the following system is stable, causal, and time-invariant. [3]

$$y(t) = x(t) \cos t$$

- (b) Find the even and odd components of [3]

$$x(t) = 2 \cos(t) - \sin(t) + 3 \sin(t) \cos(t)$$

[P.T.O.]

4. (a) Determine whether the following signals are energy signal, power signal, or neither. [3]

$$x(t) = \begin{cases} e^{-2t}, & t \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

- (b) Express the signals shown in figure 3 in terms of unit step functions [3]

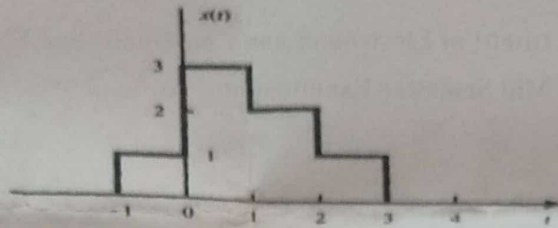


Figure 3: Signal $x(t)$.

5. (a) Sketch the following signal: [3]

$$y(t) = r(t) - 2r(t-2) + r(t-4)$$

- (b) Evaluate the following integral: [3]

$$f(t) = \int_{-\infty}^{\infty} (t^3 - 3t + 1) \delta(t-2) dt$$

- (c) Consider $x[n]$ and $h[n]$ as shown in figure 4(a) and (b), respectively. (The signals are all zero outside the ranges indicated.) Find $y[n] = x[n] * h[n]$. [8]

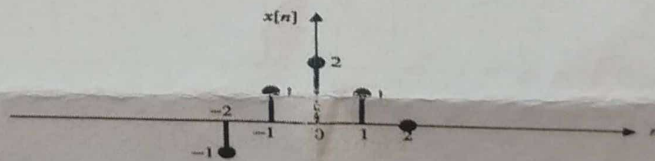


Figure 4(a): The input signal $x[n]$.

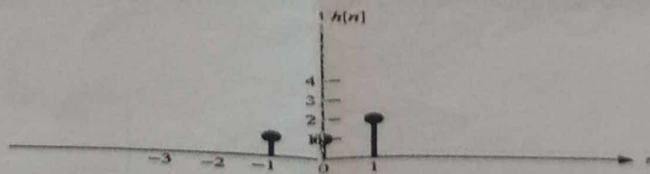


Figure 4(b): The impulse response $h[n]$.

6. Write down the difference between the following
- (a) Continuous-time and Discrete-time Signals [3]
 - (b) Energy and Power Signals [3]
 - (c) Causal and Non-Causal Systems [3]
 - (d) Linear and Nonlinear Systems [3]
 - (e) Time-varying and Time-invariant Systems [3]

End

Indian Institute of Information Technology Ranchi
Department of CSE

B. Tech (Hons.)
 Semester: 4th
 Course Code: CS2004

Mid Semester Examination
 Branch: CSE
 Course Name: Numerical Methods and Scientific Computing
QUESTION PAPER

Spring Semester 2022-23

Duration: 2 hrs.

Instructions:

Max Marks: 60

Answer all the questions. Number in [] indicates marks.

(2) Scientific calculator is allowed in the examination.

(3) Any missing data can be assumed suitably

- 1 (a) i) Find the difference between $(\frac{\Delta^2}{E})Ux$ and $\frac{\Delta^2 Ux}{E Ux}$ when $Ux = x^3$. [5]
 Where h being the interval of differencing.

- ii) Find Ux , at $x = 1.5$, which takes the values, $U_0 = 3, U_1 = 12, U_2 = 81, U_3 = 200, U_4 = 100, U_5 = 8$, without forming the difference table, find $\Delta^5 U_0$. [5]

- (b) The mode of certain frequency curve $y = f(x)$ is obtained at $x = 9.1$ and the values of the frequency function $f(x)$ for $x = 8.9, 9.0$ and 9.3 are respectively equal to $0.30, 0.35, 0.25$. Calculate the approximate value of $f(x)$ at the mode [5]

- 2 (a) By means of Newton's divided difference formula, find the values of $f(8)$ from the following table. [5]

x:	4	5	7	10	11	13
y:	48	100	294	900	1210	2028

- (b) The function $y = f(x)$ is given at the points $(7,3), (8,1), (9,1)$ and $(10,9)$. Find the value of y for $x = 9.5$, using Lagrange's interpolation formula. [5]

- 3 (a) Derive the Gauss's forward formula for equal interval [5]

- When a train is moving at 30 meters per second steam is shut off and brakes are applied. The speed of the train (V) in meters per second after t seconds is given by [8]

x:	0	5	10	15	20	25	30	35	40
y:	30	24	19.5	16	13.6	11.7	10.0	8.5	7.0

Using Simpson's rule determines the distance moved by the train.

- 4 (a) Derive a General Quadrature Formula for Equidistant Ordinates [5]

- (b) Interpolate by means of Gauss's backward formula the population for the year 1936, the following table. [5]

x:	1901	1911	1921	1931	1941	1951
y:	12	15	20	27	39	52

- 5 (a) Calculate the approximate value of [5]

$\int_0^{\pi/2}$

$\sin x \, dx$ by dividing the interval $(0, \pi/2)$ in to ten equal parts.

by Simpson's rule using 11 ordinates

Range $\rightarrow 0$

- (b) A river is 80 feet wide. The depth d (in feet) of the river at a distance x from one bank is given by the following table: [7]

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

Find the approximately the area of the cross section of the river using all the points of the data

Indian Institute of Information Technology Ranchi

Department of CSE and ECE

B. Tech Mid Semester Examination – Autumn Semester 2022-23

Semester: 4th

Branch: CSE and ECE

Course Code: EC 2004

Course Name: Microprocessors and
Microcontrollers

QUESTION PAPER

Max Marks: 60

Duration: 2 hrs.

Instructions:

- (1) Answer all the questions. Number in [] indicates marks.
- (2) Scientific calculator is allowed in the examination.
- (3) Any missing data can be assumed suitably.

- 1 (a) Discuss the different addressing modes in 8085 microprocessor with one example. [5]
(b) The accumulator value after the execution of fifth instruction on 8085 microprocessor [5]

MVI A, 33H

MVI B, 78H

ADD B

CMA

ANI 32H

- (c) Discuss in detail about different jump instructions. [5]

- 2 (a) Find the number of bytes of the following instructions: [5]
MVI C, 55H
SUB D
(b) An 8085 assembly language program is given below. After the execution of the program [10]
the content of the accumulator is

MVI A, 07H

RLC

MOV B, A

RLC

RLC

ADD B

3. Draw the PIN diagram of 8085 microprocessor and explain the functioning of all the pins [10]
4. Write an assembly language program to subtract two 16-bit numbers in 8085. [10]
5. Give the register organization of 8085 in detail. [10]

End

Indian Institute of Information Technology Ranchi

Department of Mathematics

B. Tech Mid Semester Examination – Spring Semester 2022-23

Semester: IV

Branch: ECE/CSE/ECE(ES&IoT)/CSE(DS&AI)

Course Code: MA-2002

Course Name: Combinatorics and Graph Theory

QUESTION PAPER

Duration: 2 Hrs.

Max Marks: 60

Instructions:

- (1) Answer all the questions. Number in [] indicates marks.
- (2) Scientific calculator is allowed in the examination.
- (3) Any missing data can be assumed suitably.
- (4) All symbol have there usual meaning.

- 1 (a) Consider the following program segment where i, j & k are integer variables [5]

576

```
for i := 1 to 12 do
  for j := 5 to 10 do
    for k := 15 down to 8 do
      print (i - j) * k
```

How many times is the 'print' statement executed?

- (b) Find the value of sum after the given program segment is executed: [5]

24310

```
increment := 0
sum := 0
for i := 1 to 10 do
  for j := 1 to i do
    for k := 1 to j do
      begin
        increment := increment + 1
        sum := sum + increment
      end
```

- (c) Determine a generating function and find the number of integer solutions for $c_1 + c_2 + c_3 + c_4 + c_5 = 30$; $0 \leq c_i$ for all $1 \leq i \leq 5$, with c_2 even and c_3 odd. [5]

11560

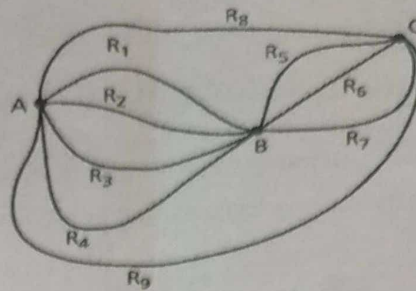
- (d) Determine the constant in $\left(4x^3 - \frac{5}{x}\right)^{16}$. [5]

6.25 x 10¹⁰

- 2 (a) Find the generating function for the number of ways an advertising agent can purchase n -minutes ($n \in \mathbb{Z}^+$) of air time if time slots for commercials come in blocks of 30, 60 or 120 seconds. Find the value of partitions of duration for $n = 60$ minutes. [10]

961

- (b) Three small towns, designated by A, B & C are interconnected by a system of two way roads, as shown in figure [10]



- 14 i) In how many ways can Y travel from town A to C?
 196 ii) How many different round trips can Y travel from town A to town C and back to town A?

- 3 (a) A ship carries 48 flags, 12 each of the colors red, white, blue & black. Twelve of these flags are placed on a vertical pole in order to communicate a signal to other ships. How many of the signals have atleast three white flags or no white flags at all using the exponential generating function? [10]

- 5852925 (b) To raise money for a new municipal pool, the chamber of commerce in a certain city sponsors a race. Each participant pays a Rs. 5 entrance fee and has a chance to win one of the different sized trophies that are to be awarded to the first eight runners who finish. [10]

- 1130220 i) If 30 people enter the race, in how many ways will it be possible to award the trophies?
 ii) If Rohan & Rohit are two participants in the race, in how many ways can the trophies be awarded with these two runners among the top three?

End

2021/09/09

Indian Institute of Information Technology Ranchi

Department of CSE

B. Tech Mid Semester Examination – Spring Semester 2022-23

Semester: 4th

Branch: CSE

Course Code: CD 2006

Course Name: Compiler Design

QUESTION PAPER

Max Marks: 60

Duration: 2 hrs.

Instructions:

- (1) Answer all the questions. Number in [] indicates marks.
- (2) Any missing data can be assumed suitably.

- 1 (a) Define NFA and DFA. Briefly explain how they are related to the regular grammar. [10]
Construct a DFA that will accept strings of zeros and ones having even number of zeros and odd number of ones.
- (b) Consider the following grammar and construct the recursive decent parser with backtracking for the string $w = cad$ [10]
 $S \rightarrow cAd$
 $A \rightarrow ab|a$
- 2 (a) Using the following grammar, discuss its ambiguity for the expression $9-5+2$ and its postfix form. [10]
 $string \rightarrow string + string$
 $string \rightarrow string - string$
 $string \rightarrow 0|1|2|3|4|5|6|7|8|9$
- (b) What is LL(1) grammar? Give a detail explanation of predictive parser. Show its functioning for string $w = frbc$ and the following grammar [10]
 $S \rightarrow Abc|ad$
 $A \rightarrow eS|Cr|\epsilon$
 $C \rightarrow fp|\epsilon$
- 3 (a) Define Lexeme, Patterns and Tokens. Obtain them along with their attribute values for an expression given below: [10]
 $\langle expr \rangle ::= \langle expr \rangle \langle op \rangle \langle term \rangle | \langle term \rangle$
 $\langle term \rangle ::= \langle number \rangle | \langle id \rangle$
 $\langle op \rangle ::= +|-$
- (b) Discuss the phases of a compiler along with their associated errors. How these errors are processed? [10]