NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

(Affiliated to Pokhara University)

Dhangadhi, Kailali

First Terminal Examination

Level: Bachelor
Semester : V_Fall
Year : 2024
Program: B.E. Computer
F.M. : 100
Course: **Digital Signal Analysis &Processing**
P. M. : 45
Time : 3 Hrs.

Candidates are required to give their answer in their own words as for as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1 a) Given the analog signal: $x(t)= 2 \sin 300\pi t + 5 \sin 500\pi$

i) Determine the minimum sampling rate required to avoid aliasing.

ii) Suppose that the signal is sampled at the rate F_s =200 Hz. What is the discrete-time signal obtained after sampling?

iii) What is the frequency $0< F<F_s/2$ of a sinusoid that yields s amples identical to those obtained in part (II)? [8]

b) What are the advantages of digital signal processing over analog signal processing? Briefly explain the basic elements of digital signal processing with the help of block diagram. [7]

2a) What are Discrete-time signals. Explain different elementary signals with its mathematical expression and signal representation. [7]

b) What is zero padding? Perform the convolution sum of the following two sequences: $x_1(n) = \{1, 2, 5, 6\}$ and $x_2(n) = \{ 2, 1, 2 \}$ [8]

3a) What is System. Explain different properties of system. [7]

b) Differentiate between an IIR filter and a FIR filter [8]

OR

Find the convolution sum of given discrete time signals using graphical method. x(n)=(2,4,6,8) and h(n)=(1,3,5,7)

4a) Define z-transform. Determine the z-transform of the signal

$x[n]=a^n u[n]$, $a>0$; where $u[n]$ is the unit-step function. [7]

b) Determine the z-transform and the region of convergence (ROC) for the signal: $x[n]=\sin(w_o n)\, u[n]$ [8]

5a) Determine the causal signal x[n] having Z-Transform [7]

$$X(z) = 1/\{(1-2z^{-1})\,(1-z^{-1})^2\}.$$

b) Draw the lattice-ladder diagram for the following system: [8]

$$H(z)=\frac{1-0.8z^{-1}-0.15z^{-2}}{1+0.1z^{-1}-0.72z^{-2}}.$$

6a) Find the direct form-I and direct form-II realizations of a discrete-time system represented by the transfer function

$$H(z) = \frac{3z^3-5z^2+9z-3}{\left(z-\frac{1}{2}\right)\left(z^2-z+\frac{1}{3}\right)}$$ [8]

b) Given a three-stage lattice filter with coefficients $K_1=1/4$, $K_2 = ½$, $K_3 = 1/3$, determine the FIR filter coefficients for the direct form structure. [7]

7. Write short notes on (any two) [2x5=10]

a. Properties of Z-transform

b. Energy signal and power signal

c. Structures for FIR filter

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First Term Examination

Level: Bachelor | Semester: V_Fall | Year : 2024

Programme: B.E. Computer | F.M. : 100

Course: **Embedded System** | P.M. : 45

Time : 3hrs.

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is embedded systems? Explain the different characteristics of embedded system? 7
   b) Explain different application areas of embedded system. 8

2. a) Differentiate between microprocessor and microcontroller. 8
   b) What will be your criteria of selecting microcontroller for your project? 7

3. a) How does real-time operating system differ from another operating system? 8
   b) What are advantages and disadvantages of context switching? 7

4. a) What is semaphore? How semaphore can be used for global resource sharing? 8
   b) Explain the concept of multithreading and multitasking in RTOS. 7

5. a) Write VHDL code for D-flip flop. 7
   b) Design a package using VHDL. 8

6. a) What are different styles of modeling technique used in VHDL? Describe them. 8
   b) Write a VHDL program for full adder using structural modeling. 7

7. Write short notes on **any two**: 2×5
   a) Sensors
   b) Deadlock
   c) VHDL program for half adder

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First Term Examination

Level: Bachelor | Semester: V_Fall | Year : 2024

Programme: B.E. Computer | F.M. : 100

Course: **Software Engineering** | P.M. : 45

Time : 3hrs.

Candidates are required to give their answer in their own words as for as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Software. Explain how Software engineering is different from system engineering. 7
   b) Define Software Myths. Explain 4 P's of Software Project Management. 8
2. a) Define Software metrics with its types. 8
   b) Explain Types and Importances of Software Measurement Indicators. 7
3. a) Explain the types of Empirical Project Estimation Technique in Details. 7
   b) Define SDLC with its Phases in details. 8
4. a) List out and explain any two types of SDLC Methods. 8
   b) Define Xtreme Programming. Explain the Lifecycle of XP. 7
5. a) Why Scrum is important in Agile methods. Explain Lifecycle of scrum. 7
   b) Define Requirement Engineering with its phases in detail. 8
6. a) Define OOA. Explain OOAD in Detail. 8
   b) Define Software Design with its Process. 7
7. Write short notes on following **(Any Two)** 5x2
   a) Software Risk Management
   b) Architectural Design
   c) Software Requirement

Good Luck!!!

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First Term Examination

Level: Bachelor | Semester: V_Fall | Year : 2024

Programme: B.E. Computer | F.M. : 100

Course: **Engineering Management** | P.M. : 45

Time : 3hrs.

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1.a) Define Management. Write down the functions of management in today's competitive environment. [7]

b) "Organization is a systematic arrangement of people brought to accomplish some specific purpose." With reference to this statement explain what organization is and highlight the major five principles of organization. [8]

2.a) Explain about the two factor theory of motivation. [8]

b) Describe about the financial and non financial motivation. [7]

3.a) Define planning. Explain about the importance of planning. [8]

b) Explain about the roles and responsibilities of an engineering manager. [7]

4.a) What do you mean by leadership? Explain about autocratic and democratic leadership styles. [7]

b) Explain about the process of planning. [8]

5.a) What are the emerging planning and organizing issues for ICT enterprises? Describe. [8]

b) Explain about the hybrid structure of organization. [7]

6.a) Compare and contrast line and line and staff organization structure. [7]

b) Show the interrelationship between authority and responsibility. [8]

7. Write short notes :(any two) [2*5=10]

a) Organizational chart

b) Scope of management

c) Importance of organizing

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First Terminal Examination

Level: Bachelor | Semester : V_Fall | Year : 2024

Program: B.E. Computer | F.M. : 100

Course: **Artificial Intelligence** | P. M. : 45

Time : 3 Hrs.

Candidates are required to give their answer in their own words as for as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1 a) What are different types of Intelligences. How do we make machines intelligent? 7

b) What are the different approaches to AI? Explain. 8

2 a. What are the risks and benefits of AI? What limitations do you think AI have? 7

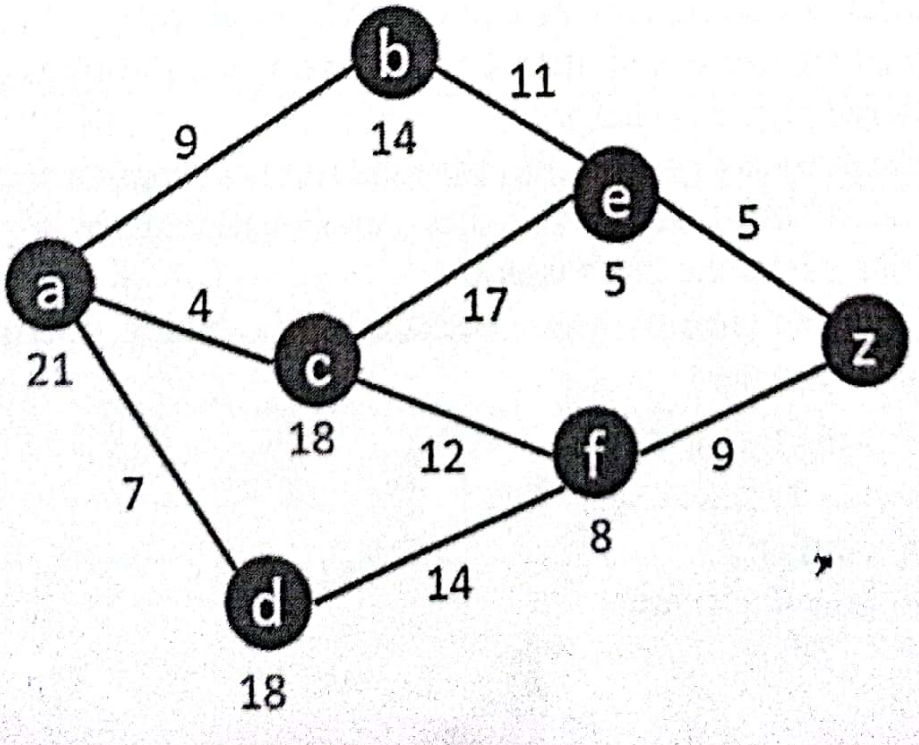
b. AI is replacing a lot of automation tasks that used to be done by humans, so how likely do you think it will replace you? 8

3 a. What are different types of ethics that govern AI? What type of efforts have you seen that are being used? 8

b. Give contrast of Agent and Environment. Explain the structure of Agent. 7

4 a. Using A * search find the shortest path. 8

2.a



b. Explain DFS and BFS with suitable graph or tree. 7

5 a. What is a Constraint Satisfaction Problem (CSP)? Solve the following cryptarithmetic problem: NAST + NAST = SOLVE. 7

b. How does alpha-beta pruning improve the efficiency of minimax search? Explain with example. 8

6 a. What are the different types of inference rules in propositional logic? Given the propositional statements: 8

r: "The sun is shining"

s: "The grass is dry", write the logical expressions for the following

i. If the sun is shining, then the grass is dry

ii. If the grass is not dry, then the sun is not shining

iii. It is not true that both the sun is shining, and the grass is not dry 7

iv. It is not true that the grass is dry, and the sun is not shining

v. Either the sun is shining, or the grass is dry, but not both

vi. If the grass is dry, then the sun is shining, and if the sun is shining, then the grass is dry

b. Represent these facts in predicate logic?

i. If the sun is shining, then the grass is dry for all locations.

ii. If the grass is not dry at some location, then the sun is not shining at that location

iii. There is some location where the sun is shining, and the grass is not dry

iv. If a car is parked, then its engine is off for all cars

v. If a phone is charged, then it will turn on, and if it turns on, then the phone is charged

vi. If the grass is dry at NAST, then the sun is shining at location NAST, and there exists some location place in NAST where the grass is dry

vii. There is no location where both the sun is shining, and the grass is not dry

7 Write Short notes on (any two) 10

a. Simulated Annealing

b. Hill Climbing

c. Min Max algorithm

NATIONAL ACADEMY OF SCIENCE AND TECHNOLOGY

Affiliated to Pokhara University

Accredited by University Grant Commission, Nepal (2022)

First Term Examination

Level: Bachelor | Semester: V_Fall | Year : 2024

Program : B.E. Computer | F.M : 100

Course : **Probability & Statistics** | P.M. : 45

Time : 3hrs.

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

Attempt all the questions.

1.a) The daily wages of workers of a factory aregiven below: [7]

Wages (Rs.)	20-40	40-60	60-80	80-120	120-200	200-280
No. of workers	5	10	15	20	20	12

Construct a histogram, frequency Polygon and frequency curve for the data

b) The lives of two models (A and B) of refrigerators in a recent survey are shown below: [8]

Life (No. of Years)	No. of refrigerators	
	Model A	Model B
0-2	5	2
2-4	16	7
4-6	13	12
6-8	7	19
8-10	5	9
10-12	4	1

i. What is the average life of each model of these refrigerators?

ii. Which model has greater uniformity?

2.a) The following data represent the income distribution of one hundred workers. [7]

Income(000)	0-20	20-40	40-60	60-80	80-100
No.of persons	6	25	35	25	9

Find : i) The income limits of middle 50% workers.

ii) The minimum income of the richest 25% of the workers.

b) The expenditure of 1000 families is given below

Expenditure	40-59	60-79	80-99	100-119	120-139	Total
No. of families	50	—	500	—	50	1000

Find missing frequencies. If the median is 87. [8]

3.a) The steam and leaf display represent the bounced check fee for s sample of 25 banks for direct deposit customers. [7]

Steam	Leaves
1	5 5 8 8
2	0 0 0 0 1 2 2 5 5 5 5 5 8 8 9
3	4 5 6 7 7
4	1 2

i. What are the two information obtained from this steam and leaf display.
ii. What percentage of items is before 30.
iii. Around what value bounced check fees concentrate.

b) The following are the numbers of minutes that a person had to wait for the bus to work on 15 working days, 10,1,13,9,5,9,2,10,3,8,6,17,2,10,15 Draw a box plot and interpret the result. [8]

4.a) State and prove Baye's theorem [7]

b) The contents of urns I, II and III are as follows:
1 white, 2 black and 3 red balls
2 white balls, 1 black and 1 red balls.
4 white, 5 black and 3 red balls. [8]
One urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come form urns I,II or III?

5.a)A random variable X has the following probability mass function. [7]

X:	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2K	0.3	K

Find:
i. The value of K
ii. Expected value of X
iii. Standard deviation of X

b) In a particular college in Nepal it has been found that 20% of the students withdraw without completing the engineering course, assume that 15 students have resisted in a new semester , what is the probability that

i. None will withdraw the course. [8]
ii. At most two will withdraw the course
iii Find the mean of the distribution.

6 a) The following table gives the age X and blood pressure Y of 10 women

X	56	42	36	47	49	42	60	72	63	55
Y	147	125	118	128	145	140	155	160	149	150

Find correlation coefficient between age and pressure. [7]

b) The following are the heights in centimeter and weights in kilogram of 8 men:

Height	160	168	174	176	180	181	182	185
Weight	65	66	68	70	75	76	78	80

i)Develop the estimating regression equation of weight on height.
ii) Estimate the weight of men whose height is 175cm. [8]

7. Write short notes on (Any two) [2x5=10]
   i. Sources of data
   ii. Scope of statistics in engineering.
   iii. Independent and dependent events.