Q. No. ECE 610/ 54

B.TECH/EVEN
-REG/(22-23)

Even Semester Mid-term Examination, 2022-23

ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING

ECE 610

Full Marks : 25 *Time* : 90 Minutes

The figures in the margin indicate full marks.

Graph paper shall be supplied, if required.

Answer *all* the questions.

Question No.	Body of the Question	Marks	Mapped CO

1. The following function is to be minimized using Flower Pollination Algorithm: $F= X_1^2 + X_2^2 + X_3^2$ 13 CO2

Initial random population is

$$\begin{bmatrix} X1 & X2 & X3 \\ -3.8 & -8.8 & 7.4 \\ 4.2 & -6.5 & 5.3 \\ -9.1 & 3.8 & -2.6 \end{bmatrix}$$

Upper and lower bound of every variable is +11 and -11 respectively. Apply the usual equation in the global pollination only $x_i^{t+1} = x_i^t + L(Best\_solution - x_i^t)$ and calculate new solution set at the end of first iteration after comparing it with the initial. Assume Levy flight(L) = 0.03. Calculate the best solution and its value at the end of first iteration in the global pollination only. Limit the variable value to the upper and lower bound if anyone is trying to cross in either direction.

2 Describe the different steps involved in minimizing a function using Particle Swarm Optimization. 12 CO2

COURSE OUTCOMES

CO1: Basics of optimization and soft computing algorithms

C02: Learn different soft computing algorithms

C03: Learn artificial neural network and its training

C04: Study of radial basis function neural and its training

C05: Study of machine learning algorithms and clustering

Q. No. ECE 611/ 52

B.TECH/EVEN
REG/(22-23)

Even Semester Mid-term Examination, 2022-23

COMPUTER ORGANIZATION AND ARCHITECTURE

ECE 611

Full Marks : 25 *Time* : 90 Minutes

The figures in the margin indicate full marks.

Graph paper shall be supplied, if required.

Answer *all* the questions.

Question No.	Body of the Question	Marks	Mapped CO

1. (A) What do you mean by Processor-Memory Performance Gap? 2 CO1

   (B) A computer has 1 GB of memory. Each word in this computer is 32 bits. How many bits are needed to address any single word in memory? 1 CO1

2. Write the difference between (any *two*): 4 CO1

   (A) Little Endian, Big Endian

   (B) von-Neumann Architecture, Harvard Architecture

   (C) CISC versus RISC Architectures

3. (A) Suppose that a compute-intensive bioinformatics program is running on a given machine X, which takes 10 days to run. The program spends 25% of its time doing integer instructions, and 40% of time doing I/O. Which of the following two alternatives provides a better tradeoff? 4 CO3

(a) Use an optimizing compiler that reduces the number of integer instructions by 30% (assume all integer instructions take the same time).

(b) Optimizing the I/O subsystem that reduces the latency of I/O operations from 10 μsec to 5 μsec (that is, speedup of 2).

Or

(B) Consider two levels of cache memory, L1 -cacheand L2-cache. Assumptions:

- Without the cache, memory operations take 30% of execution time.

- The L1-cache speeds up 80% of memory operations by a factor of 4.

- The L2-cache speeds up 50% of the remaining 20% memory operations by a factor of 2.

We want to find out the overall speedup.

4. • Consider a processor with three instruction classes A, B and C, with the corresponding CPI values being 1, 2 and 3 respectively. The processor runs at a clock rate of 1 GHz. 4 CO3

For a given program written in C, two compilers produce the following executed instruction counts.

Compute the MIPS rating and the CPU time for the two program versions.

	Instruction Count (in millions)		
	For IC_A	For IC_B	For IC_C
Compiler 1	7	2	1
Compiler 2	12	1	1

Or

- Suppose that a program is running on a machine with the following instruction types, CPI values, and the frequencies of occurrence.

The CPU designer gives two options: (a) reduce CPI of instruction type A to 1.1, and (b) reduce CPI of instruction type B to 1.6. Which one is better?

Type	CPI	Frequency
A	1.3	60 %
B	2.2	10 %
C	2.0	30 %

5. • Write a prorgam using MIPS32 instructions to Calculate sum of 10, 32-bit numbers stored in consecutive memory locations. 4 CO2

Or

• Write a prorgam using MIPS32 instructions to Read two numbers from the keyboard and print the sum.

6. • All MIPS32 instructions can be classified into three groups in terms of instruction encoding. 6 CO2

– R-type (Register), I-type (Immediate), and J-type (Jump).

Explain with suitable examples.

COURSE OUTCOMES

CO1: Acquire idea about computer architecture and organization.

CO2: Understand the fundamental concepts of ISA.

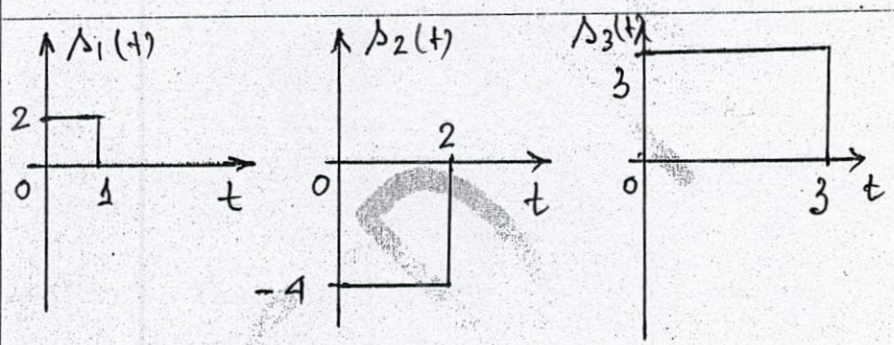
CO3: Illustrate the operations of the memory unit.

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
Odd Semester End-Sem Examination, 2022-23

Course Code: ECE 612
Course Name: Advanced Digital Communications

Full Marks: 25
Time: 1 hr. 30 mins.

Instructions: All questions are compulsory

Question No.	Body of the Question	Marks	Mapped CO
1	$\{ s_i(t) \mid i = 1,2,3, \ldots\ldots\ldots, M \}$ is a set of signals. Each of these signals is represented as a point or vector in an N-dimensional Euclidean space. Prove that i) $\|\|\bar{S}_i\|\|^2 = \sum_{j=1}^{N} s_{ij}^2$, $i = 1, 2, \ldots, M$ ii) $E_i = \|\|\bar{S}_i\|\|^2$, where E_i is the energy of the signal. iii) $\|\|\bar{S}_i - \bar{S}_k\|\|^2 = \sum_{i=1}^{N} (s_{ij} - s_{kj})^2 = \int_0^T [s_i(t) - s_k(t)]^2 \, dt$ where the symbols have their usual meanings.	5	CO1
2	 Using Gram-Schmidt orthogonalisation procedure, find a set of orthonormal basis functions to represent the signals $s_1(t)$, $s_2(t)$, and $s_3(t)$ shown in the Fig above.	10	CO1
3	Write the equations of BFSK signals. Define suitable orthonormal basis functions with proper justifications to represent the BFSK signals as vectors. Consequently show the signal constellation diagram.	5	CO2
4	A 4800 bits/sec data terminal is connected to a modem. Calculate the transmission bandwidth B_T required at the modem output for each of the following scheme. Assume roll-off factor 0.5, (i) OOK transmission (ii) Eight-phase PSK	2+3 = 5	CO2

Q. No. ECE 618/ 55 B.TECH/EVEN
REG/(22-23)

Even Semester Mid-term Examination, 2022-23

DATA COMMUNICATION AND COMPUTER NETWORKS

ECE 618

Full Marks : 25 *Time* : 90 Minutes

The figures in the margin indicate full marks.

Answer *all* the questions.

Question No.	Body of the Question	Marks	Mapped CO

1. (a) A variance in grade of service considering a communication network operating in the following two modes is being observed. 5 CO2

Mode 1: number of subscribers = 25, number of channels = 5, data arrival rate = 3 requests per minute, data termination rate = 2 processed per minute; at any point of time 5 subscribers are found initiating data requests with initial grade of service = 0.02.

Mode 2: number of subscribers = 25, number of channels = 5, data arrival rate = 3 requests per minute, data termination rate = 2 processed per minute; at any point of time less than equal to 5 subscribers are found initiating data requests with initial grade of service = 0.02.

What can you conclude from the above considering data retries come after some random time which is longer than the average execution time of any data request and is independent of previous retry times, if any?

(b) With Poisson arrival of 2 data requests per minute, what is the probability that more than 3 data requests will arrive in 2 minutes? In addition, also compute the time during which at least 4 data requests will arrive with a probability of more than 95%? 5 CO1

2. (a) Give a graphical approach to Little's theorem. 5 CO3

(b) Get an expression for the total amount of time spent on an average by a data request at a network node where the arrival follows a Poisson distribution and the service times are not necessarily of exponential nature. 5 CO4

3. (a) The probability of queuing in a statistically multiplexed M/M/1 communication system with average Poisson arrival rate=λ and departure rate=mμ is .....
(DERIVE the above) 3 CO4

(b) The steady state analysis of any communication system is applicable for deterministic arrival and departure of call/data requests. Is this TRUE/ FALSE? Justify. 2 CO1

COURSE OUTCOMES

CO1: **Understand** the rudiments of how computers communicate.

CO2: **Acquaintance** with the architecture of a number of different networks.

CO3: **Understand** the principles of protocol layering.

CO4: **Understand** the basic aspects of packet based protocol design and implementation.

CO5: **Analyze** and **Explain** the information flow in network traffic.

CO6: **Interpret** the importance of interconnection networks.
