

Artificial Intelligence

2070

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Attempt all questions :

- 1.) What is 'Turing Test' in Artificial Intelligence (AI)? Criticize the performance of the 'Turing Test' to measure the intelligence of the machine.
- 2.) Explain the uninformed search techniques with example.
- 3.) If we set the heuristic function $h(n)=g(n)$ for both greedy as well A*. what will be effect in the algorithms? Explain.
- 4.) The minimax algorithm returns the best move for MAX under the assumption that MIN play optimally. What happens when MIN plays suboptimally?
- 5.) Translate the following sentence into first order logic :
 - i.) "Everyone's DNA is unique and is derived from their parents' DNA".
 - ii.) "No dog bites a child of it's owner".
 - iii.) "Every gardener likes the sun".
 - iv.) "All purple mushrooms are poisonous".
- 6.) Represent the following sentences into a semantic network .

Birds are animals.
Birds have feathers, fly and lay eggs.
Albatross is a bird.
Donald is a bird.
Tracy is an albatross.
- 7.) What is an expert system? Explain the architecture and feature of rule-based expert system.
- 8.) What are conceptual graphs? Represent the following statements into conceptual graph.

"King Ram marry Sita, the daughter of king Janak".
- 9.) What is machine learning? Explain the learning from analogy and instance based learning?
- 10.) What is Bayesian Network? Explain how Bayesian Network represents and inference the uncertain knowledge.

Artificial Intelligence

2071

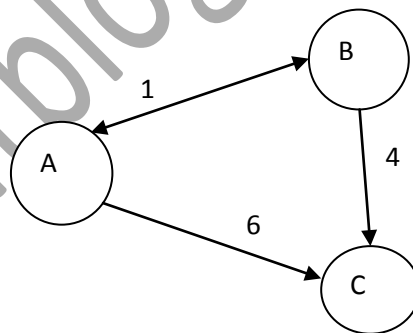
Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Attempt all questions :

- 1.) Define with suitable supporting statements and examples, "Artificial Intelligence is the system that act like humans".
- 2.) For each of the following agents, determine what type of agent architecture is most appropriate (i.e., table lookup, simple reflex, goal-based or utility-based).
 - a.) Medical diagnosis system
 - b.) Satellite image analysis system
 - c.) Part-picking robot
 - d.) Refinery controller
- 3.) Consider the following graph, steps cost is given on the arrow. Assume that the successors of a state are generated in alphabetical order, and that there is no repeated state checking. A is the starting node and C is goal node.



- a.) Of the four algorithms breadth-first, depth-first and iterative-deepening, which find a solution in this case?
 - b.) Write sequence of node expanding by algorithm if finds solution.
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- 4.) Define learning. Why learning frame work is required? Explain about learning frame work with block diagram and examples.
 - 5.) Briefly describe the approaches of knowledge representation with example.
 - 6.) Consider the following sentence :

$[(\text{food} \Rightarrow \text{party}) \vee (\text{drinks} \Rightarrow \text{party})] \Rightarrow [(\text{food} \wedge \text{drinks}) \Rightarrow \text{party}]$

- a.) Convert the right hand and left hand sides of main implication into CNF.
 - b.) Prove the validity of sentence using resolution.
- 7.) Convert the following sentence into predicate logic .
- a.) "No dog bites a child of its owner"?
 - b.) "No two adjacent countries have the same color"?
- 8.) Why disjunctive normal form is required? Explain all the steps with examples.
- 9.) What is the difference between symbolic and non-symbolic AI? Represent the following knowledge in semantic network.
- Robin is bird
Clyde is a Robin
Clyde owns a nest from spring 2014 to fall 2014
- 10.) Explain the steps of Natural Language Processing.

Computer Networks

2070

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Group A

Attempt all questions :

(2*10=20)

- 1.) Explain the functioning of 7 layers of OST model. What is the necessity of using 7 layers concept in OST Model?

OR

Explain the various layers of TCP/IP. Also, lists the protocols used in each layer.

- 2.) Explain how does CRC detect the errors with multiple bits? Given message is $M(x) = x^2 + x^4 + x^3 = x^2 + 1$ and the generator is $G(x) = x^3 + 1$. Show the actual bit string transmitted, suppose the third bit from the left is inverted during the transmission. Show how the error is detected at the receiver's end.

Group B

Attempt any eight questions :

(8*5=40)

- 3.) What are sliding window protocol? Explain one-bit sliding window protocol with an appropriate diagram.
- 4.) Explain how slatted Aloha improves the performance of system over pure Aloha.
- 5.) Describe multimedia networking and its various applications.
- 6.) Why routing is important in a computer network? Differentiate between adaptive and non-adaptive routing algorithms.
- 7.) Differentiate between broadband and base band services.
- 8.) How does ATM differ from frame relay? List and briefly define the ATM service classes.
- 9.) Compare and contrast the IPV4 and the IPV6 header files. Do they have any fields in common?
- 10.) Define multiplexing. Discuss the need for multiplexing in network system.
- 11.) What is meant by "domain name"? How is a domain name translated to an equivalent IP address? Explain with the help of an example.

Computer Networks

2071

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Group A

Attempt all questions :

(2*10=20)

- 1.) Define protocol. Why do we need layered protocol architecture? Discuss each layer of TCP/IP protocol architecture in detail.

OR

Define transmission media. Differentiate between guided and unguided transmission media. Discuss each guided transmission in detail.

- 2.) What is routing? Discuss link state routing algorithm in detail.

Group B

Attempt any eight questions :

(8*5=40)

- 3.) Explain client server system. How is it different from peer to peer system?
- 4.) Discuss HTTP in detail.
- 5.) Discuss the importance of multiplexing in data communication.
- 6.) Assume a class B network and divide it into four subnets. What is the value of new subnet mask.
- 7.) Discuss CRC as an error detection mechanism.
- 8.) Explain the importance of multimedia network.
- 9.) Why is network management an important task?
- 10.) What is congestion control? Why do we need it?
- 11.) Write short notes on :
- a.) DNS
 - b.) Streaming audio and video

Computer Networks

2070

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Group A

Attempt all questions :

(2*10=20)

- 1.) Explain the functioning of 7 layers of OST model. What is the necessity of using 7 layers concept in OST Model?

OR

Explain the various layers of TCP/IP. Also, lists the protocols used in each layer.

- 2.) Explain how does CRC detect the errors with multiple bits? Given message is $M(x) = x^2 + x^4 + x^3 = x^2 + 1$ and the generator is $G(x) = x^3 + 1$. Show the actual bit string transmitted, suppose the third bit from the left is inverted during the transmission. Show how the error is detected at the receiver's end.

Group B

Attempt any eight questions :

(8*5=40)

- 3.) What are sliding window protocol? Explain one-bit sliding window protocol with an appropriate diagram.
- 4.) Explain how slatted Aloha improves the performance of system over pure Aloha.
- 5.) Describe multimedia networking and its various applications.
- 6.) Why routing is important in a computer network? Differentiate between adaptive and non-adaptive routing algorithms.
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Tribhuvan University
Institute of Science and Technology
2071
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Bachelor Level / Third Year /Fifth Semester/Science
Computer Science and Information Technology (CSc.301)
(Computer Networks)

Full Marks: 60
Pass Marks: 24
Time: 3 hours

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

Group A

Long Answer Questions:

Attempt all questions.

(2×10=20)

1. Define protocol. Why do we need layered protocol architecture? Discuss each layer of TCP/IP protocol architecture in detail.

OR

Define transmission media. Differentiate between guided and unguided transmission media. Discuss each guided transmission media in detail.

2. What is routing? Discuss link state routing algorithm in detail.

Group B

Short Answer Questions:

Attempt any eight questions.

(8×5=40)

3. Explain client server system. How is it different from peer to peer system?
4. Discuss HTTP in detail.
5. Discuss the importance of multiplexing in data communication.
6. Assume a class B network and divide it into four subnets. What is the value of new subnet mask.
7. Discuss CRC as an error detection mechanism.
8. Explain the importance of multimedia network.
9. Why is network management an important task?
10. What is congestion control? Why do we need it?
11. Write short notes on:
a) DNS
b) Streaming audio and video

Tribhuwan University
Institute Of Science and Technology
Design and Analysis of Algorithm
2070

Full Marks : 80

Pass Marks : 32

Time : 3 Hours

Attempt all questions :

1.) Explain the term Big-oh, Big-omega and Big-theta. Show that a function $f=3n^2+4n+7$ is big theta of n^2 . (8)

2.) What do you mean by a recurrence relation? Solve the following recurrence relation using iterative expansion method (2+6)

a.)
$$T(n) = \begin{cases} 2T(n/2)+1, & n>1 \\ 2, & n=1 \end{cases}$$

b.)
$$T(n) = \begin{cases} 2T(n/2)+Kn, & n>1 \\ 1 & n=1 \end{cases}$$

3.) write an algorithm for quick-sort and trace out the algorithm for the following array

$A[] = \{ 16, 7, 15, 14, 18, 25, 55, 32 \}$. (4+4)

4.) How can you solve the selection problem in linear time? Write the algorithm and analyze for its time complexity. (8)

5.) What is prefix code? You have given a message text having seven distinct characters {p,q,r,s,t,u,v} with frequency {40,20,15,12,8,3,2}. Trace the Huffman algorithm to build the free and obtain the optimum prefix codes for each characters. (2+6)

6.) Explain Prim's algorithm for computing the MST of a given graph and analyze it. Also verify the correctness of this algorithm. (5+3)

7.) Distinguish the main idea for divide and conquer approach with dynamic programming approach. Find the longest common subsequence between two sequences $\langle A, B, C, B, D, A, B \rangle$ and $\langle B, D, C, A, B, A \rangle$. (2+6)

8.) Define convex hull in 2D. Explain the Graham's scan algorithm for computing convex hull and analyze it. (2+6)

9.) Explain about the complexity classes P, NP and NP complete with suitable examples. (8)

10.) Explain Dijkstra's algorithm for computing the single source shortest path in a graph with suitable example. (8)

Tribhuvan University
Institute Of Science and Technology
Design and Analysis of Algorithm
2071

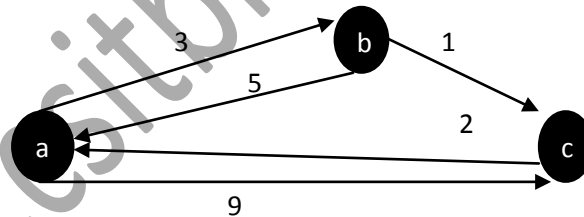
Full Marks : 80

Pass Marks : 32

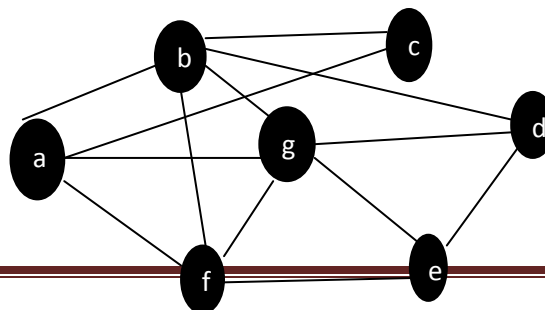
Time : 3 Hours

Attempt all questions :

- 1.) Why do you need the algorithm analysis? Explain the best, worst and average case complexities with suitable example. (2+6)
- 2.) Explain the master method for solving the recurrence relations. Solve the following recurrence relations using this method. (2+3+3)
 - a.) $T(n) = 3T(n/2) + n$
 - b.) $T(n) = 2T(n/4) + \sqrt{n}$
- 3.) Explain the divide and conquer approach for algorithm design. Design the binary search algorithm and analyze its time complexity. (2+6)
- 4.) Explain the merge-sort algorithm with example and analyze its time complexity. (8)
- 5.) What do you mean by a prefix code? How Huffman algorithm generates prefix codes? Explain with an example. (2+3+3)
- 6.) Discuss the 0/1 knapsack problem and how this problem can be solved? Explain the algorithm. (4+4)
- 7.) Explain the algorithm to find the all pair shortest path of a weighted connected graph. Trace the algorithm for the following graph. (3+5)



- 8.) Write an algorithm for depth first search. Use depth first search to find a spanning tree of the following graph. (3+5)



- 9.) Define the convex hull in 2D. Write the Graham's scan algorithm for computing the convex hull of points in 2D and analyze its time complexity. (2+6)
- 10.) What do you mean by approximation algorithm? Write the algorithm for approximate the vertex cover of a connected graph with example. (2+6)

E-Governance

2070

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Group A

Attempt any two questions :

(2*10=20)

- 1.) What is e-governance? Why do we need it? Discuss its scope and content in detail.
- 2.) Discuss broadcasting/wider dissemination model and comparative analysis model of e-governance along with applications.
- 3.) Define the terms data warehousing and data mining. Discuss key areas that demand the use of data warehousing and data mining.

Section B

Attempt any eight questions :

(8*5=40)

- 4.) Discuss different IT tools that are used to deliver services to citizens.
- 5.) Discuss the realized level of maturity model in detail.
- 6.) How can we achieve good governance through e-governance models? Explain.
- 7.) What is e-readiness? Discuss data system infrastructural preparedness of e-readiness.
- 8.) How can we use data warehousing and data mining to prepare the government to face the challenges of the new millennium. Discuss.
- 9.) What is cyber law? Discuss the current scenario of cyber law in Nepal.
- 10.) Mention the current scenario of e-governance in Nepal.
- 11.) What are characteristics of maturity level? Explain in detail.
- 12.) Discuss key focus areas of maturity levels in detail.
- 13.) Write short notes :
 - a.) Digital divide
 - b.) Legal infrastructural preparedness

E-Governance

2071

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Group A

Attempt any two questions :

(2*10=20)

- 1.) What is e-governance? Discuss the issues in e-governance applications and the digital divide.
- 2.) Discuss critical flow model and mobilization model and lobbying model of e-governance along with applications.
- 3.) What is data warehousing and data mining? How can you use these concepts in e-governance? Discuss.

Group B

Attempt any eight questions :

(8*5=40)

- 4.) What are the content of e-governance? Explain in detail.
- 5.) Discuss the institutionalized level of maturity model in detail.
- 6.) How can we achieve good governance through e-governance models?
- 7.) What is e-readiness? Discuss legal infrastructural preparedness of e-readiness.
- 8.) How can we use data warehousing and data mining concepts in agriculture and rural development?
- 9.) What is cyber law? Discuss the current scenario of cyber law in Nepal.
- 10.) Discuss the current scenario of e-governance in Nepal.
- 11.) What are the key focus areas of maturity levels? Explain.
- 12.) Discuss evolutionary stages in e-governance in detail.
- 13.) Write short notes on :
 - a.) E-governance scope
 - b.) Technological infrastructural preparedness

Simulation and Modeling

2070

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Group A

Attempt any two questions :

(2*10=20)

- 1.) Why do we perform the analysis of simulation output? Explain how do you use simulation run statistics in the output analysis. (4+6)
- 2.) Describe the linear congruential method for random number generation. Use the Multiplicative congruential method to generate a sequence of four-three digit random integers, with seed=117, constant multiplier=43 and modulus=1000. (4+6)
- 3.) Consider that a machine tool in a manufacturing shop is turning out parts at the rate of one every 5 minutes. As they are finished, the parts go to an inspector, who takes 4 ± 3 minutes to examine each one and rejects about 10% of the parts. Now, develop a block diagram and write the code for simulating the above problem using GPSS, and also explain the function of each block used in the block diagram in detail. (3+3+4)

Group B

Attempt any eight questions :

(8*5=40)

- 4.) Differentiate between analytical models and numerical models. (5)
- 5.) Define congestion in a queuing system, and describe its major characteristics. (1+4)
- 6.) Describe the process of model building, verification, and validation in brief. (5)
- 7.) Explain, how do you update the clock time in system simulation. (5)
- 8.) What are the different phases that are employed in system simulation study? Explain in brief. (5)
- 9.) The sequence of numbers 0.54, 0.73, 0.97, 0.10, and 0.67 has been generated. Use the kolmogorov – smirnov test $\alpha=0.05$ to determine if the hypothesis that the numbers are uniformly distributed on the interval [0,1] can be rejected. (Note that critical value of D for $\alpha=0.05$ and $\mu=5$ is 0.565). (5)
- 10.) Describe different types of statements, used in CSMP, with suitable examples. (5)
- 11.) "To simulate is to experiment". Justify it.
- 12.) Name the entities, attributes, activities, events, and state variables for the following systems :
 - a.) Cafeteria
 - b.) Inventory
 - c.) Banking
 - d.) A hospital emergency room
 - e.) Communication
- 13.) Write short notes on :

- a.) System, boundary and system environment
- b.) Real time simulation

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Simulation and Modeling

2071

Full Marks : 60

Pass Marks : 24

Time : 3 Hours

Group A

Attempt any two questions :

(2*10=20)

- 1.) Explain the steps in simulation study. What are the limitations of simulation?
- 2.) Explain the Markovchains with examples and its applications.
- 3.) What do you mean by uniformity test? Explain the poker test with example.

Group B

Attempt any eight questions :

(8*5=40)

- 4.) What are the types of simulation models?
- 5.) What are the elements of queuing system?
- 6.) What do you mean by pseudo random numbers?
- 7.) Explain the process of testing for auto-correlation test.
- 8.) Explain with example of calibration and validation of model.
- 9.) Explain the replication of runs.
- 10.) Use the multiplicative congruential method to generate of five digit random integers.
 $X_0=118$, $a=45$ and $m=1000$.
- 11.) What do you mean by simulation tool?
- 12.) Explain with example verification of simulation models.
- 13.) Write short notes on :
 - a.) Discrete systems modeling
 - b.) Feedback systems

Tribhuvan University
Institute of Science and Technology
2067

Bachelor Level/Third Year/Fifth Semester/Science

Full Marks: 60

Computer Science and Information Technology

Pass Marks: 24

(CSC 308 – Wireless Networking)

Time: 3 hours.

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 questions.

1. Define wireless communication. Compare first and second generation cellular system.[1+5]
2. A GSM system operating at 900 MHz needs a receiver sensitivity of 50 dBm at a distance of 500m from the transmitter. Transmitting antenna gain and receiving antenna gain are 10dB and 8dB respectively. At what power level the signal should be transmitted to satisfy the above condition? Use free space path loss model.[6]
3. Define modulation. Explain minimum shift keying (MSK) modulation technique.[1+5]
4. Why diversity is used in wireless communication? Explain different diversity mechanism.[1+5]
5. Define co-channel cell. Find the distance between the nearest co-channel cell in hexagonal topology with necessary diagram.[1+5]
6. Define adjacent channel interference. Explain how adjacent channel interference can be reduced.[2+4]
7. Explain frequency division multiple access technique.[6]
8. Define handoff. Explain briefly about different handoff strategies.[2+4]
9. Write briefly on operation of mobile IP.[6]
10. Write short notes on (any two)
 - (a) Near-far effect
 - (b) OFDM
 - (c) Aloha
 - (d) Mobile TCP hierarchy

Tribhuvan University
Institute of Science and Technology
2068

Bachelor Level/Third Year/Fifth Semester
Computer Science and Information Technology
(CSC. 308 – Wireless Networking)

Full Marks: 60
Pass Marks: 24
Time 3 Hours.

Candidate are required to give their answers in their own words as for as practicable.

The figures in the margin indicate full marks.

Attempt all questions.

1. What are the major challenges in wireless communication network? How can we combat those challenges? (3+3)
2. What are Doppler Effect and Doppler shift? Calculate Doppler shift for a person walking at a 3 km/hr in 900 MHz cellular system. (6)
3. Define modulation. Explain QPSK modulation technique.
4. Why channel equalization is used in wireless communication? Explain linear channel equalization. (1+5)
5. Define co-channel interference and adjacent channel interference. In a cellular system, the acceptable signal-to-cochannel interference ratio is 20dB. From the measurement the path loss exponent is found to be 4. What is the minimum cluster size? (2+4)
6. Explain briefly about different techniques for capacity increase in cellular system.
7. Explain time division multiple access technique. (3+3)
8. Describe the steps involved in setting up the call between MSC and the called MSC with flow diagram. (6)
9. Write short notes on MIPv6. Also mention the advantages over MIPv4. (6)
10. Write short notes on **(Any TWO)**: (2×3)
 - a) Fading
 - b) Probability of error of BPSK
 - c) Aloha
 - d) Call Admission Control (CAC)

Tribhuvan University
Institute of Science and Technology
Model QuestionPaper

Bachelor Level/Third Year/Fifth Semester/Science

Full Marks: 60

Computer Science and Information Technology

Pass Marks: 24

(CSC 308 – Wireless Networking)

Time: 3 hours.

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. List out the key points of wireless communication development. What are the challenges in wireless communication network?[3+3]
2. A GSM system operating at 900 MHz has operating power of 40 W. The transmitter and receiver gain are 5 dB each. By using free space path loss
 - (a) Express the transmission power in dBm.
 - (b) Calculate free space path loss between the BS and MS separated by 5 Km.
 - (c) Calculate received power.[3x2]
3. Define modulation. Explain about GMSK transmitter and receiver.[1+3+2]
4. Define diversity. Explain different diversity mechanism.[2+4]
5. Explain the concept of frequency reuse. In AMPS cellular system with 30 KHz channel BW, a S/I of 18dB is required for acceptable speech quality. By using path loss exponent of 4
 - (a) Calculate D/R.
 - (b) Calculate the cluster size or frequency reuse factor.[3+3]
6. Explain briefly about different techniques for capacity increase in cellular system.[6]
7. What is multiple access technique? Write briefly on TDMA with its advantage over FDMA.[1+5]
8. Describe the steps involved in setting up the call between the calling MSC and the called MSC with flow diagram.[6]
9. Write briefly on operation of mobile IP.[6]
10. Write short notes on [any two][2x3]
 - (a) Rayleigh fading
 - (b) QPSK
 - (c) MIPv4 vs. MIPv6
 - (d) Handoff management