

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 4th Year 1st Term Examination, 2018
 Department of Computer Science and Engineering
 CSE 4105
 Computer Networks

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) State the problems of a stop-n-wait type reliable data transfer protocol. Design a reliable, pipelined data transfer protocol that uses no buffer for out of order packets. (15)
- b) Briefly describe the services provided by TCP. (09)
- c) Show the format of HTTP request line. Mention at least two request type used by HTTP version 1.1 and explain. (06)
- d) Explain common FTP commands. (05)

2. a) Consider transferring an enormous file of L bytes from host A to host B. What is the maximum value of L such that TCP sequence numbers are not exhausted? Assume an MSS of 1460 bytes. (05)
- b) The TCP of a host receives five segments at the time shown (HH:MM:SS.mmm) below. If it has no data to send, show the acknowledgements sent by the host using line diagram. (09)
 (i) at 0:0:0.000 (ii) at 0:0:0.027 (iii) at 0:0:0.400 (iv) at 0:0:1.200 (v) at 0:0:1.208
- c) Show a sample SMTP interaction between SMTP client and server to transfer the message "Good morning my friend" from alice@xxx.com to bob@yyy.com. (11)
- d) In TCP, what problems are solved by the following timers and how? (10)
 (i) Persistence timer (ii) Time-waited timer

3. a) Suppose a DNS client is looking for the IP address of www.kuet.ac.bd. It already sent a query message to the DNS server. Show the response message sent by the server. Use necessary DNS compression. Assume the IP address is 128.175.13.63. (10)
- b) Explain the necessity of mail access agent in email system. Compare and contrast the functionalities of POP and IMAP. (09)
- c) Since UDP is unreliable, why is it used at transport layer? (05)
- d) What do you mean by digital signature? How does RSA provides digital signature mechanism? (11)

4. a) (15)

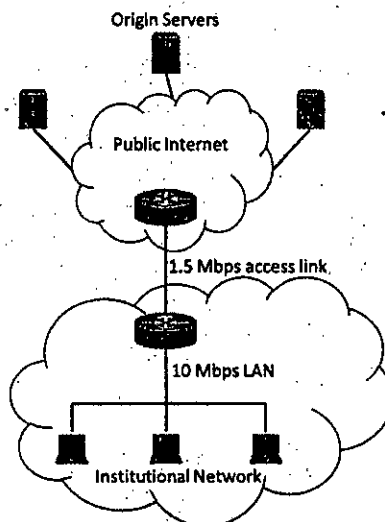


Figure 4(a)

Consider Figure 4(a), for which there is an institutional network connected to the internet. Let the average object size is 900 kbit and the average request rate from institutional browsers to the origin servers is 1.5 request per second. Also suppose that the amount of time it takes from when the router on the internet side of the access link forwards an HTTP request until it receives the response in two seconds on average. Model the total average response time as a sum of the average access delay and the average internet delay. For average access delay, use $\Delta/(1-\Delta\beta)$, where Δ is the time required to send an object over the access link and β is the arrival rate of objects to the access link.

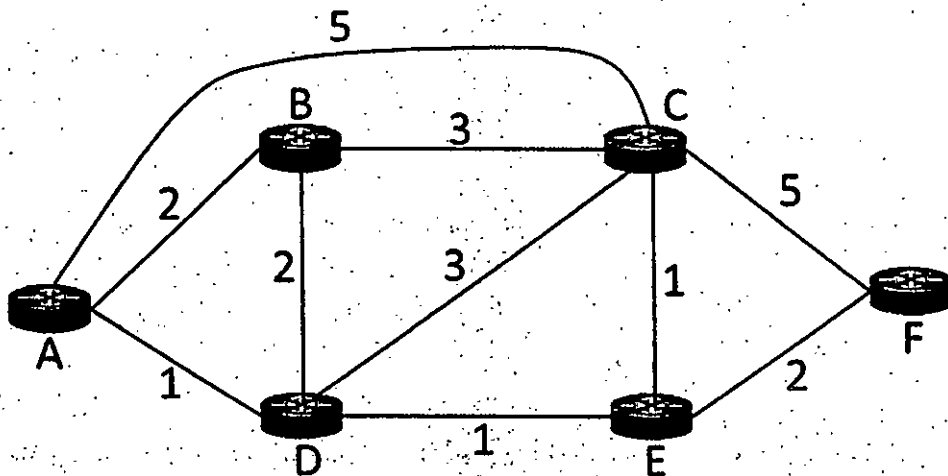
- i) Find the total average response time.
- ii) Now suppose a web cache is installed in the institutional LAN. Let the hit rate is 0.4. Find the total response time.

- b) In symmetric key system, how do two entities establish shared secret key over a network? (10)
Explain a solution with suitable example.
- c) List down the steps involved in SSL handshaking. Also present a pictorial view of packets transmission. (10)

SECTION B

(Answer ANY THREE questions from this section in Script B)

- 5. a) How does header checksum can be calculated in IPv4 datagram? Why does it cover only data portion? Explain with example. (12)
- b) Define Computer Network. What are the major functionalities of Computer Network? (08)
- c) Apply Fragmentation on following information for IPv4 Datagram. (15)
 - i) Original Datagram : 5000 bytes, Header : 20 bytes.
 - ii) MTU : First level 2000 bytes and Second level 800 bytes.
- 6. a) Concisely describe the error reporting messages of ICMP. (10)
- b) Determine the routing table/forwarding table at the router B from the following topology using a Link-State Routing Algorithm. (17)



- c) "Switch is more intelligent than hub" – justify the statement. (08)
- 7. a) A router inside an organization receives a packet with the destination 190.240.33.91. How does it find the subnetwork address to route the packet? Assume the subnet mask is /19. (05)
- b) Write a short note on Address Resolution Protocol (ARP). (09)
- c) What is count to infinity problem? Use a suitable example to show that the poisoned reverse technique can solve the problem. (12)
- d) Why do we need Network Address Translation (NAT)? Briefly explain how NAT works. (09)
- 8. a) Consider the data bits $D=11011011$ and Generator $G=10110$. Calculate the Cyclic Redundancy Check bit R . (12)
- b) How does Slotted ALOHA random access MAC protocol work? Show the efficiency of it. (13)
- c) Write down the services provided by the data link layer. (10)

TIME: 3 hours

FULL MARKS: 210

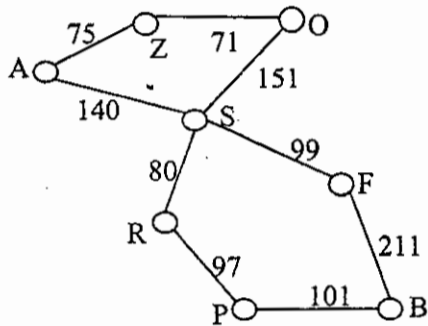
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SECTION A

(Answer ANY THREE questions from this section in Script A)

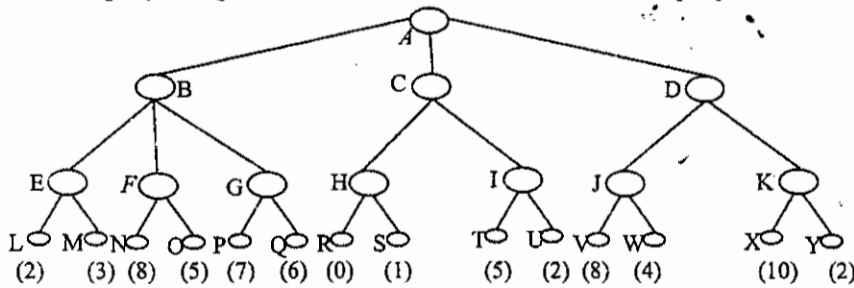
1. a) Define an Agent. Explain the structure of a learning agent. Use physical example(s). (12)
- b) Describe the perception-action cycle of a robot which will move in a two dimensional grid world. (13)
- c) "A* search is optimal if $h(n)$ is consistent". Justify the statement. (10)

2. a) What is a heuristic function? Explain how to develop it for a particular problem. (10)
- b) What is PEAS? For each of the following activities, give a PEAS description of the task environment: (i) Playing soccer and (ii) Knitting a sweater. (10)
- c) Consider the following graph and associated information. Which one of greedy best and A* search will give better route from A to B? Explain using necessary details: (15)



Straight line distance to B	
A	366
B	0
F	176
O	380
S	253
R	193
P	100
Z	374

3. a) How can you formally define a search problem? Explain using an example. (07)
- b) "Uniform costs search act like BFS when step costs are equal"- justify. (05)
- c) Prove each of the following statements, or give a counter example: (10)
 - (i) "Iterative deepening search performs much worse than depth-first search".
 - (ii) "Uniform-cost search is a special case of A* search".
- d) Consider the following game tree in which the static scores (in parentheses at tip nodes) are all from the first player's point of view. Assume that the first player is the maximizing player. (13)



(i) What move should the first player choose? (ii) What nodes would not need to be examined using alpha-beta algorithm, assuming that nodes are examined in left-to-right order?

4. a) What is a Constraint Satisfaction Problem (CSP)? Explain the different types of constraints those to be handled to solve CSPs. (08)
- b) Use local search with min-conflict heuristic algorithm to solve n -queen problem. (09)
- c) What is fuzzy set? Differentiate between fuzzy set and classical set. (06)
- d) Based on the following "how to buy fresh fish" problem, construct a set of fuzzy rules: "If you go to the fish market to buy some fresh fish, you must know how to identify one. First, look at the eyes of the fish. If the eyes are reddish then the fish is no longer fresh, if the eyes are clear then the fish is fresh. Another tip is to look at fish's gills. The gills should be in rich red for the fish to be fresh. Otherwise, if the gills look pale red then it indicates that the fish is somewhat old and no longer fresh." Based on your given fuzzy rules, construct a Fuzzy Associative Memory (FAM) accordingly. (12)

SECTION B

(Answer ANY THREE questions from this section in Script B)

5. a) What do you mean by resolution refutations? Explain using an example. (11)
- b) What is uncertainty? How do you deal with uncertainty? Explain with example. (08)
- c) Write down the differences between probabilistic and worst-case reasoning. (06)

- d) Suppose you have a Wumpus world that consists of 2 cells: (1, 1) and (2, 1). In the truth table below, $P_{i,j}$ represents the fact that there is a pit at (i, j) and Knowledge Base (KB) represents the overall truth value of the KB. (10)

$P_{1,1}$	$P_{2,1}$	KB
F	F	F
F	T	F
T	F	T
T	T	T

Does the KB $\models P_{2,1}$? Explain your answer. What does it mean for an inference procedure to be complete?

6. a) Consider the following table, where S = snow, R = rain and D = dry. (15)

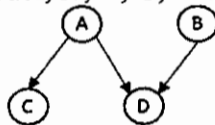
	ϕ	{S}	{R}	{D}	{S, R}	{S, D}	{R, D}	{S, R, D}
Mfreeze	0	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Mstorm	0	0.2	0.1	0.1	0.2	0.1	0.1	0.2
Mboth								

Here, assume two pieces of evidence: Temperature is below freezing and Barometric pressure is falling.

Compute (i) Mboth, (ii) Belief ({S, R}) using Mboth, (iii) Belief ({S, R}) using Mfreeze, and (iv) Belief ({S, R}) using Mstorm.

- b) What is Dempster/Shaffer theory? Explain with example(s). (06)
 c) Write down the differences between first order logic (FOL) and propositional logic. (05)
 d) Translate the following sentences into FOL sentences: (09)
- Every member of the Hoofers club is either a skier or a mountain climber or both.
 - Some women are more knowledgeable than others except than herself.
 - Every fruit other than apricots and pineapples is bad and spoilt.
 - Apricots and pineapples are bad fruits and spoilt.

7. a) Define syntax, semantics, pragmatics and discourse with example. (09)
 b) In the following graphical model, A, B, C, and D are binary random variables. (08)



How many parameters are needed to define the Conditional Probability Distributions (CPD's) for this Bayes Net?

- c) You will use the dataset below to learn a decision tree which predicts if people pass machine learning (yes or no), based on their previous GPA (High, Medium or Low) and whether or not they studied. (14)

GPA	Studied	Passed
L	F	F
L	T	T
M	F	F
M	T	T
H	F	T
H	T	T

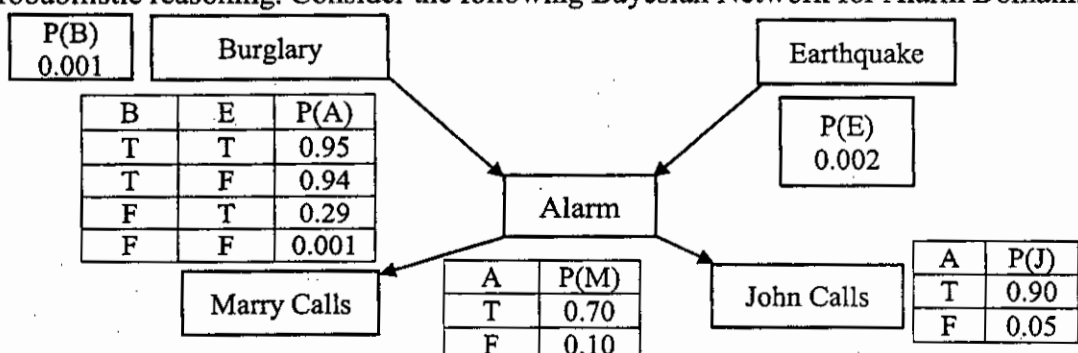
For this problem, you can write your answer using \log_2 , but it may be helpful to note that $\log_2 3 \approx 1.6$. (i) What is the entropy $H(\text{Passed})$?, (ii) What is the entropy $H(\text{Passed} | \text{GPA})$? and (iii) Draw the full decision tree that would be learned for this data set.

- d) What is unification? Why is it so important to FOL? (04)

8. a) What is a parse tree in NLP, and for what is it used? (05)
 b) Construct a Grammar for the following sentence: "The policeman shot the thief with the gun". (09)
 Also draw the syntactic tree.

- c) What is rule based expert system? Explain basic structure of a rule based expert system. (08)

- d) Define probabilistic reasoning. Consider the following Bayesian Network for Alarm Domain. (13)



Compute (i) $P(\neg J, \neg M, B, E)$ and (ii) $P(J, M, A, \neg E, B)$

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 4th Year 1st Term Examination, 2018
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CSE 4111

Machine Learning

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) What is Machine Learning? Briefly discuss some practical applications of Machine Learning. (05)
b) Explain McCulloch-Pitts model of artificial neuron with appropriate sketch. Describe (08)
significance of its individual components.
c) Explain the difficulties of solving XOR problem with single neuron. Solve XOR problem (10)
through manipulation by hidden neurons for AND and OR logic.
d) How does the cross-validation technique evaluate machine learning algorithms? Explain. (06)
e) "The choices of training data and target concepts are two important issues in designing a (06)
machine learning system" – justify the statement with appropriate examples.
2. a) What is the key difference between traditional algorithms and machine learning algorithms? (05)
b) Write down the back propagation (BP) weight update rule for both hidden layer neurons and (10)
output layer neurons where sigmoidal and tanh functions are used as activation function in
output and hidden layers, respectively.
c) How momentum parameter speed up training in BP? (06)
d) What are MLP and RBF network? Write down the differences between MLP and RBF (06)
network.
e) Draw sketch diagram of a RBF network and put parameter values to solve XOR problem. (08)
3. a) Why ensemble of several neural networks is necessary when a network with hidden layer may (05)
approximate any arbitrary function?
b) What do you mean by independent, sequential and simultaneous training of component (10)
networks in ensemble construction? Mention prominent ensemble methods with each type of
component network training.
c) Describe Bagging and AdaBoost ensemble methods with graphical representation. Compare (10)
the methods in different issues such as, training set size, ensemble decision and so on.
d) Describe an ensemble method which promotes diversity altering error of individual network. (10)
Is such technique suitable for ensemble of Decision Tree? Explain.
4. a) What do you understand by Swarm Intelligence (SI)? Write down common features of SI (05)
based algorithms.
b) What do you mean by exploration and exploitation? Explain exploration and exploitation (08)
tradeoff in Particle Swarm Optimization (PSO).
c) "In PSO, each and every particle changes position in each iteration even the particle is the (08)
global best (G)" – are you agree with the statement? Justify your answer with appropriate
assumptions in velocity update equation.
d) Write down the equations of transition probability and pheromone update of Ant Colony (09)
Optimization (ACO). Describe effects of key parameters in ACO.
e) Describe significance properties of ACO with respect to other population based algorithms. (05)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Define GA. Explain the working principle of GA with a flowchart. (07)
b) "Crossover is explorative and Mutation is exploitative" – justify the statement with respect to (10)
GA. What are the effects of too high and too low Mutation rate?
c) Write down the similarities and dissimilarities between GA and PSO. (06)
d) Apply the Enhanced Edge Recombination algorithm on the following two chromosomes to (12)
produce two child. Show all steps.

Parent 1:	4	2	1	3	5	6
Parent 2:	4	3	1	2	6	5

6. a) What is the problem of using normal crossover and mutation operators in GA for solving Travelling Salesman Problem (TSP)? Briefly explain Insert Mutation operator for TSP. (09)
- b) What is Decision Tree? Write down the steps of Decision Tree construction. (07)
- c) What is Information Gain? How does Information Gain handle continuous-valued attributes? (07)
- d) Consider the following table where attribute 'Status' represents class label. Find the root attribute of the Decision Tree using Gain Ratio as the attribute selection measure. (12)

Department	Age	Status	Salary
Sales	31-35	Senior	Medium
Sales	26-30	Junior	Low
Marketing	36-50	Senior	High
Secretary	26-30	Senior	Medium
Secretary	36-50	Senior	High
Sales	36-50	Junior	High
Marketing	31-35	Senior	Medium
Marketing	26-30	Junior	Low
Secretary	31-35	Junior	Medium
Secretary	26-30	Junior	Low

7. a) Distinguish between Supervised and Unsupervised learning. (06)
- b) What is the problem associated with K-means clustering algorithm? How K-medoid clustering method solve this problem? Explain. (12)
- c) What are the advantages of Hierarchical clustering over Partitioning method of clustering? (05)
- d) Consider the following 5 data points. (12)
- (1, 1), (3, 2), (7, 9), (8, 7), (9, 8)
- Find the clusters using Agglomerative clustering and use Complete Link proximity as distance measure. Show all steps.
8. a) What is the problem of DBSCAN algorithm? Discuss. (05)
- b) Explain core-distance and reachability-distance with graphical representation. (06)
- c) Briefly explain the curse of dimensionality problem. (06)
- d) Consider the following dataset with 2 dimensions. (18)

Dimensions 1	Dimensions 2
2.5	2.4
0.5	0.7
2.2	2.9
1.9	2.2
2.5	3.0
2.7	2.5
2.0	1.6
1.0	1.1
2.5	2.6
2.1	1.9

Using Principal Component Analysis (PCA), reduce the dataset to one dimension. Explain each step with necessary calculations.

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
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CSE 4115

Computer and Network Security

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Through Shannon characteristics, discuss the characteristics of good cipher. Define the terms: 'confusion' and 'diffusion'. (10)
- b) Define known-plaintext attack. How it can be associated with RSA cryptosystem? (10)
- c) On same modulus using RSA, how multiple parties can encrypt data? (09)
- d) Show that "RSA cryptosystem is homomorphic". (06)
2. a) Discuss properties of digital signature. Explain ElGamal digital signature algorithm with an example. (12)
- b) Explain the working procedure of ElGamal cryptosystem specifying that it is based on discrete logarithm problem. (10)
- c) Make a comparison between the mechanism of AES and DES. Describe AES algorithm using a block diagram. (13)
3. a) Define cryptographic hash function. Discuss properties of it. (07)
- b) How and why you combine digital signature and public key cryptography? Explain. (08)
- c) Discuss the parameters that make a computer network vulnerable. (10)
- d) Define sensitive data. Discuss the factors that can make data sensitive. (10)
4. a) How documents can be signed using public key cryptography and one way hash function? Discuss. (07)
- b) Discuss 'stream cipher' and 'block cipher'. Explain a specific key exchange protocol to distribute a key. (13)
- c) How 'primitive element' relates with ElGamal? (08)
- d) What are the requirements of database security? Explain them. (07)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Give an intuitive explanation of the working principle of Elliptic Curve Cryptography (ECC). Also explain how encryption and decryption work in ECC. (13)
- b) Explain ECC based digital signature with mathematical proof. (10)
- c) What are the reasons to prefer ECC over RSA? (05)
- d) What is tapjacking? Explain the prevention mechanism used against tapjacking in context of Android operating system. (07)
6. a) Write short notes on following attacks: (16)
 - i. Page-in-the-Middle.
 - ii. Program Download Substitution.
 - iii. SQL Injection.
 - iv. Man-in-the-Browser.
- b) Explain how attackers use User-in-the-Middle attack to bypass CAPTCHA protection. (06)
- c) What are web bugs? Explain how websites can be protected against unwanted change both from administrator's and users' perspective. (13)
7. a) With appropriate code and stack diagram explain how Buffer Overflow can be exploited to execute attacker's provided code. Also explain some common counter measures that are used against Buffer Overflow attack. (18)
- b) Explain the uses of Format String attack with appropriate example(s) and stack diagrams. (11)
- c) Explain Integer Overflow attack using suitable example(s). (06)
8. a) Write short notes on the followings: (14)
 - i. Salami Attack.
 - ii. Covert Channel.
 - iii. Document Virus using Microsoft's Dynamic Data Exchange (DDE).
- b) Explain the problems associated with Access Control Directory. (06)
- c) Explain the problems associated with Segmentation and Paging. Also discuss how combining Paging with Segmentation provides better performance for protection in general purpose operating system. (15)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
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 CSE 4127

Image Processing and Computer Vision

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

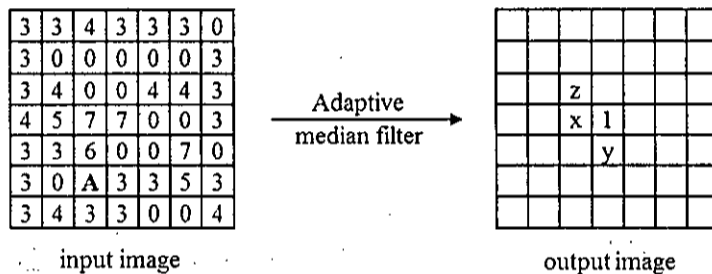
SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Compare and contrast between image processing and computer vision. Mention some applications of them. (08)
- b) Use Laplacian operator to sharp the following image. Use necessary border reflection padding. (15)

$$\begin{bmatrix} 1 & 2 & 5 & 4 \\ 5 & 2 & 5 & 5 \\ 2 & 1 & 6 & 3 \\ 2 & 4 & 7 & 6 \end{bmatrix}$$

- c) What is periodic noise? Design a band reject and a notch reject filter to remove such noise from image. Also discuss their pros and cons. (12)
2. a) Given an input image of size 7x7 shown below, was filtered using 3x3 adaptive median filter with maximum allowed size of 5x5. (12)



Answer the following questions with reasoning:

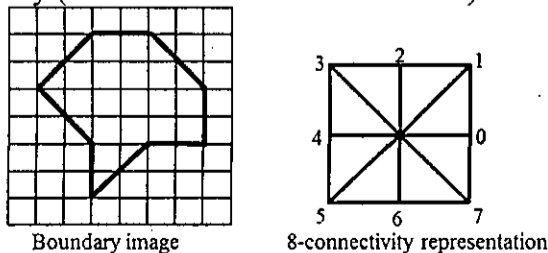
- i. What is the value of the pixel A in the input image?
- ii. What are the values of pixels x, y and z in the output image?
- b) Explain why and how non-maximum suppression is performed in Canny edge detection algorithm. (10)
- c) Let a 3-bit grayscale image is given below: (13)

0	5	2
6	1	7
3	4	7

Resize the image by using bilinear interpolation and backward mapping to obtain 3x5 image.

3. a) Show that $\nabla^2 G = \frac{1}{\pi\sigma^4} \left[1 - \frac{x^2 + y^2}{2\sigma^2} \right] \cdot e^{-\frac{x^2 + y^2}{2\sigma^2}}$, where G is the Gaussian function and ∇^2 is the Laplacian operation. (08)
- b) What is Thresholding? List the steps of Otsu's Thresholding algorithm. (11)
- c) Compare the first order and second order derivative based edge detection methods. (10)
- d) State and prove the separability property of 2D DFT. (06)

4. a) For the following boundary (in counter-clock-wise direction) (09)



compute the 8-connected

- i. chain code.
- ii. chain code that is invariant to rotation.
- iii. chain code that is invariant to both starting point and rotation.

b) Consider two consecutive frames of a video shown below. (14)

$y \backslash x$	0	1	2	3	4
0	3	15	6	4	0
1	4	4	12	1	2
2	4	14	5	5	8
3	6	1	13	2	3
4	10	7	11	9	12

Frame - 1

$y \backslash x$	0	1	2	3	4
0	4	6	5	3	0
1	2	3	15	6	4
2	3	4	5	12	1
3	10	4	13	5	5
4	9	6	1	13	2

Frame-2

Estimate the optical flow of the center pixel using Lucas-Kanade method. Use 3x3 window for spatial coherence.

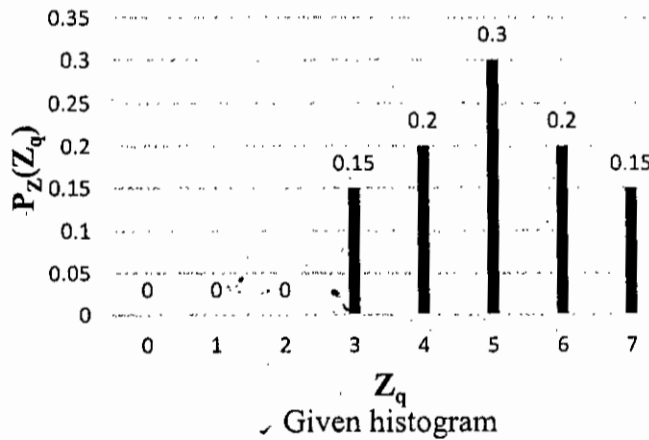
c) Explain inverse filtering process to restore a noisy image. What is the shortcoming of inverse filter? How does Wiener filter overcome such shortcoming? (12)

SECTION B

(Answer ANY THREE questions from this section in Script B)

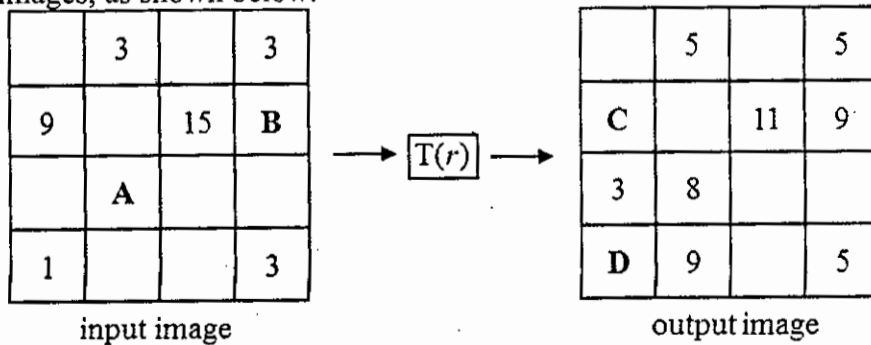
5. a) What is digital image and digital image processing? What are the fundamental steps in digital image processing? (10)
 - b) Define blind spot and brightness adaption. Briefly describe how to characterize brightness discrimination using appropriate example. (08)
 - c) What do you mean by image compression? Briefly describe about Discrete Cosine Transformation of image compression. (12)
 - d) What are the changes occur in an image by changing values in spatial domain and quantization (Gray value)? (05)
6. a) Define contrast. Design a mapping function to enhance the contrast of an image having very bright pixels. (11)
 - b) Briefly describe Power-law transformation for digital image processing and also show the image appearance of different values of gamma. (08)
 - c) The following table shows the information of a 3-bit 64x64 image. (16)

Pixel Value	Frequency
0	790
1	1023
2	850
3	656
4	329
5	245
6	122
7	81



Draw the original histogram, normalized histogram and finally show the matching histogram with the given histogram.

7. a) Let a 4-bit, 4x4 image passes through an intensity transformation function given by $s = T(r) = \alpha \log_2(1+r) + \beta$, where α, β are constants. Few pixels are available in the input and output images, as shown below. (10)



What are the values of the pixels A, B and C, D in the input and output images respectively?

- b) Define Pseudo color image processing. Discuss about intensity slicing with appropriate diagram. (10)
- c) Write down the procedure to compute pruning of a binary image. (05)

d) Consider the following 5x5 8-bit image with grayscale range of [0, 9]. (10)

$$\begin{bmatrix} 0 & 5 & 7 & 7 & 5 \\ 7 & 2 & 6 & 2 & 6 \\ 6 & 9 & 7 & 7 & 0 \\ 6 & 6 & 1 & 7 & 6 \\ 9 & 3 & 2 & 4 & 8 \end{bmatrix}$$

Compress the image using Huffman encoding techniques and also discuss the efficiency of this compression.

8. a) Consider the following binary image A. (12)

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Image A

Show the result of applying the following operations on image A with a 3x3 structuring elements.

i. $B = (A \oplus S) \cap A^c$

ii. $B = (A \ominus S) \cup A^c$

iii. $B = (A \oplus S) \cup A^c$

- b) How can you detect how many template images are there in a full image using hit or miss transformation algorithm? Briefly describe with appropriate example. (11)
- c) Define Hue and Saturation. Write down the process of conversion of a pixel value from HSI color space to RGB color space. (12)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 4th Year 1st Term Examination, 2018
 Department of Computer Science and Engineering
 IEM 4127
 Industrial Management

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer ANY THREE questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.
 iii) Standard Normal Distribution Table.
 iv) Assume reasonable data if missing any.

SECTION A

(Answer ANY THREE questions from this section in Script A)

1. a) Define management. Why management is considered as a dynamic process? Explain. (13)
 b) Describe the necessary skills that have to be possessed by a manager in brief. (12)
 c) Explain how management and administration are similar and different. (10)
2. a) What is scientific management theory? Explain the Fayol's 14 principles of management. (15)
 b) Explain contingency approach theory. What are the contribution and limitations of contingency approach? (15)
 c) Write down three rules of manager. (05)
3. a) Define motivation. Discuss the two-factors theory of motivation. (15)
 b) Explain the Murray's theory of human personality. (10)
 c) Define the term "Recruitment". What are the differences between recruitment and selection? (10)
4. a) Define layout. State the layout format you would recommend and why, for: (i) A chemistry lab, (ii) A university cafeteria and (iii) The processing of mail at the post office. (10)
 b) Is the facilities-location problem for services different from that for manufacturing and in what respects? Explain with example. (12)
 c) Alum Co Ltd. Plans to set up a new aluminum-products plant and has selected three sites with following characteristics (for projected 75% capacity utilization equal to 300,000 tons/year) (13)

Site	Annual fixed costs (millions)	Variable costs/ton
A	8.2	\$452
B	10	290
C	7.5	530

Relevant Subjective factors	Rating R_{ij}			Relative importance index W_j
	A	B	C	
Housing	.25	.50	.25	.50
Community attitudes	.25	.25	.50	.25
Services	.50	.25	.25	.25

SECTION B

(Answer ANY THREE questions from this section in Script B)

5. a) Define forecast. What are the main advantages that quantitative techniques for forecasting have over qualitative techniques? What limitations do quantitative techniques have? (12)
 b) An electrical contractor's records during the last five weeks indicated the number of job requests. (13)

Week:	1	2	3	4	5
Requests:	20	22	18	21	22

Predict the number of requests for week 6 using each of these methods: (i) A linear trend equation, (ii) Naive, (iii) Exponential Smoothing with $\alpha = 0.30$. Use 20 for week 2 forecast.

- c) Define breakeven point graphically. Why break even study is important? Also explain, why breakeven quantity goes down when variable cost is reduced. (10)
6. a) "Inventory is called necessary evil" – explain. Describe briefly the A-B-C approach to inventory control. (12)
 b) Deduce the EOQ model with assumptions. Also make a comparison between EOQ and EPQ model. (11)
 c) A small manufacturing firm uses roughly 3400 pounds of chemical dye a year. Currently the firm purchases 300 pounds per order and pays \$3 per pound. The supplier has just announced that orders of 1000 pounds or more will be filled at a price of \$2 per pound. The manufacturing firm incurs a cost of \$100 each time it submits an order and assigns an annual holding cost of 17 percent of the purchase price per pound. (12)

(i) Determine the order size that will minimize the total cost.

(ii) If the supplier offered the discount at 1500 pounds instead of 1000 pounds, What order size would minimize total cost?

7. a) What is dummy activity? Why it is used? A project consists of a series of tasks labeled A, B, ..., H, I with the following relationships ($W < X, Y$ means X and Y cannot start until W is completed; $X, Y < W$ means W cannot start until both X and Y are completed). With this notation construct the network diagram having the following constraints: $A < D, E$; $B, D < F$; $C, E < G$; $B < H$; $F, G < I$. (10)
- b) Why is there a need for aggregate planning? Briefly describe demand and capacity options for aggregate planning. Also discuss the basic strategies for meeting uneven demand. (10)
- c) A project manager has compiled a list of major activities that will be required to install a computer information system in her firm. The list includes estimated completion times for activities and precedence relationships. If the project is finished within 26 weeks of it's start, the project manager will receive a bonus of \$1000, and if the project is finished within 27 weeks of it's start, the bonus will be \$500. Find the probability of each bonus. (15)

Activity	Immediate Predecessor	Estimated times (Weeks)
A	-	2-4-6
D	A	6-8-10
E	D	7-9-12
H	E	2-3-5
F	A	3-4-8
G	F	5-7-9
B	-	2-2-3
I	B	2-3-6
J	I	3-4-5
K	J	4-5-8
C	-	5-8-12
M	C	1-1-1
N	M	6-7-11
O	N	8-9-13
END	H, G, K, O	

8. a) Write short notes on the following: (15)
- (i) Market Value, (ii) Salvage Value, (iii) Preventive maintenance, (iv) Types of MIS, (v) Generative process planning.
- b) The following table contains information on the cost to run three jobs on four available machines. Determine an assignment plan that will minimize costs. (10)

		Machine			
		A	B	C	D
Job	1	12	16	14	10
	2	9	8	13	7
	3	15	12	9	11

- c) Using the information given in the following table, determine an order processing sequence using s/o priority rule. (10)

Order	Processing time remaining (days)	Due Date (days)	Number of operations remaining
A	20	30	2
B	11	18	5
C	10	6	2
D	16	23	4