

Time :2 ½ Hours

[Total Marks:
60]

- N.B:** (1) All questions are compulsory.
(2) Figures to the **right** indicate full marks.
(3) **Assume additional data if necessary** but state the same clearly.
(4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.
- Q.1 Attempt any two of the following (12)
a) State and Explain different challenges in Ad-hoc Networking. 06
b) State and Explain the difference between WAN and MAN. 06
c) Explain any one routing protocol in detail 06
d) Write a short note on OSI Model. 06
- Q.2 Attempt any two of the following (12)
a) State and Explain advantages of Software Defined Networking. 06
b) Discuss Openflow in detail with example. 06
c) Write a short note on SDN Data Plane. 06
d) Explain the working of SDN Application Plane. 06
- Q.3 Attempt any two of the following (12)
a) Explain SDN Virtualization architecture. 06
b) Write a short note on Cloud Modern Networking Architecture. 06
c) Write a short note on Fog Compting. 06
d) Explain different components of IoT. 06
- Q.4 Attempt any two of the following (12)
a) Write a short note on Access control List. 06
b) State and Explain MPLS implementation. 06
c) Write a short note on VRF 06
d) Discuss and relate implementation of OSPF v2 and V3. 06
- Q.5 Attempt any two of the following (12)
a) Discuss the Implementation of IPv6 along with their components. 06
b) Write a short note on SDN Control Plane. 06
c) How QoS is achieved in Modern Networking? 06
d) Explain the concept of Load balancing with example. 06

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 - (5) Use of **calculators** and statistical tables are **allowed**. / If required keep it.

- Q.1 Attempt any two of the following (12)
- a) What is signal? Types of signal and Explain term periodic and aperiodic signal? 6
 - b) What is noise and types of noise? Explain Gaussian noise? 6
 - c) Write note on discrete Fourier transform and inverse discrete Fourier transform? Write any five properties of DFT with formula? 6
 - d) Explain term- (1) High Pass Filter (2) Low Pass Filter 6
- Q.2 Attempt any two of the following (12)
- a) What is image processing? Explain briefly application of image processing? 6
 - b) What is Log Transform and Power – Law transform? 6
 - c) Explain Histogram Equalization technique? 6
 - d) Explain smoothing of Images using linear filter with mean filter? 6
- Q.3 Attempt any two of the following (12)
- a) Explain Robert edge detection techniques with example. 6
 - b) Explain Hit-or-Miss Transformation with
$$A \otimes B = (A \ominus B_1) \cap (A^c \ominus B_2)$$
 6
 - c) Explain Basic Morphological Operations and write note on convex hull morphological algorithm. 6
 - d) Explain boundary extracting technique. 6

Q.4 Attempt **any two** of the following (12)

a) The following six symbol and their probabilities are given in tabular form. Generate Huffman code for them. 6

Symbol	A1	A2	A3	A4	A5	A6
Probability	0.1	0.4	0.06	0.1	0.04	0.3
Find average word length?						

b) What is Histogram of Oriented Gradients and Explain steps to calculate HOG features. 6

c) Write short note on following: 6

(1) Region-Based Segmentation (2) Edges based segmentation

d) Explain Grabcut algorithm with use of GrabCut uses Gaussian Mixture Models (GMM)? 6

Q.5 Attempt **any two** of the following (12)

a) Find the circular convolution of the two finite duration sequences $x_1(n) = \{1, -1, -2, 3, -1\}$ $x_2(n) = \{1, 2, 3\}$ 6

b) Explain the any six tools and libraries for image processing? 6

c) Explain Edge Detection technique? 6

d) Write note on properties of Fourier transform? 6

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- Q.1 Attempt **any two** of the following (12)
- a) Explain the role of a designer in the optimization process 6
 - b) What are critical points? Explain its importance to find local minimizer. 6
 - c) Golden section search uses the golden ratio to approximate Fibonacci search. Thus, explain Fibonacci and golden section search on a unimodal function. 6
 - d) Give an example of a nontrivial function where quadratic fit search would identify the minimum correctly once the function values at three distinct points are available 6
- Q.2 Attempt **any two** of the following (12)
- a) Prove that $d^{(k+1)}$ and $d^{(k)}$ are orthogonal using gradient decent 6
 - b) State the first order methods. Thus explain Adagrad method 6
 - c) Explain Secant Method in detail. 6
 - d) When finding roots in one dimension, when would we use Newton's method instead of the bisection method? 6
- Q.3 Attempt **any two** of the following (12)
- a) Explain how to calculate pairwise distance between point in sampling plan. 6
 - b) What is the use of Quasi-Random Sequences? Thus state the quasi-Monte Carlo method's error convergence as compared to Monte Carlo integration. 6
 - c) What is the use of Holdout method? Explain 6
 - d) Explain the linear models in detail. 6
- Q.4 Attempt **any two** of the following (12)
- a) What are different types of uncertainty explain any three. 6
 - b) $f(z) \approx \hat{f}(z) = \sum_{i=1}^k \theta_i b_i(z)$ 6
 In the 'explain two inferences of the coefficients. Thus visualize the Orthogonal basis functions for uniform, exponential, and unit Gaussian distributions.
 - c) What is dynamic programming? Explain 6
 - d) Explain Ant Colony optimization as an optimal approach for solving Travelling salesman's problem 6

- Q.5 Attempt **any two** of the following (12)
- a) What is Unimodality? Explain. 6
 - b) Explain the working of, RMSProp. And thus explain its advantages over Adagrad. 6
 - c) Explain how Greedy local search and the exchange algorithm can be used to find a subset of points that maximally fill a space. 6
 - d) When would we use a more descriptive model, for example, with polynomial features, versus a simpler model like linear regression . 6
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