Time :2 Hours **[Total Marks: 50]**

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 **(10)**
a) Define Research. Explain the role of Research in Computer Science
b) State and explain the steps involved in Research Process
c) Discus the characteristics of a Good Literature Review.
d) Write a short note on Grounded Theory Research.

Q.2 Attempt **any two** of the following **(10)**
a) Write a short note on Data Collection Development Plan.
b) Explain the API Data Collection Method in detail.
c) How is Primary data different from secondary data with respect to research design?
d) Discuss Open Ended Surveys as a Qualitative Data Collection method for Research.

Q.3 Attempt **any two** of the following **(10)**
a) Discuss the different types of Data Analysis.
b) Write a short note on Data Visualization Tools.
c) What is Exploratory Data Analysis (EDA)? Explain in brief.
d) How to draw valid conclusions in research? Discuss.

Q.4 Attempt **any two** of the following **(10)**
a) Explain the structure of a research paper.
b) Discuss the guidelines for preparing effective research presentations.
c) Explain in detail the steps involved in Peer Review process.
d) What is the significance of et.al in citation? Explain with example.

Q.5 Attempt **any two** of the following **(10)**
a) Discus the characteristics of a Good Literature Review.
b) Explain the Ethical Considerations for Data Collection for Research.
c) What is the use of Inferential Statistics in Research? Explain.
d) Write a short note on Key Components of Confidentiality in Research.

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(Time :1 Hours) **[Total Marks: 25].**

N.B: (1) **All questions are compulsory.**
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Q.1 Attempt **any two** of the following **(10)**

a) Define regular expression. Generate regular expression for the following statement. **05**
- (0+1) * 0
- (b* (aaa)* b*) *

b) List out drawbacks of top- down parser. Eliminate left recursion from the following production set. **05**

$S \rightarrow P$

$P \rightarrow Pd / Pe / aQ / ac$

$Q \rightarrow bQc / f$

c) Write a note on syntax analyzer generator YACC. **05**

d) Consider the grammar **05**

E –> 2E2
E –> 3E3
E –> 4

Perform Shift Reduce parsing for input string "32423"

Q.2 Attempt **any two** of the following **(10)**

a) What is Loop Optimization in Compiler Design? Perform induction variable elimination for the following three address code. **05**

i:= i+1
x:= 3*i
y:= a[x]
if y< 15, goto B2

b) What is activation record? Explain the activation record. **05**

c) Explain machine dependent and machine independent optimization techniques. **05**

d) Discuss debugging and testing process used in compilation. **05**

Q.3 Attempt **any one** of the following **(05)**

a) State the general form of Postfix and infix notation. convert the following infix expression to postfix form **05**

(A-B)*(C/D)$F
A+B/C$E+F*G

b) Explain the phases of compiler. **05**

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Time :2 ½ Hours **[Total Marks: 50]**

N.B: (1) **All questions are compulsory.**
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(4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.

Q.1	Attempt **any two** of the following	**(10)**
a)	Explain any one Routing protocol in detail.	**05**
b)	Write a short note on Ad-hoc Networking.	**05**
c)	Discuss the Implementation of IPv6 along with their components.	**05**
d)	Explain encapsulation.	**05**
Q.2	Attempt **any two** of the following	**(10)**
a)	Write a short note on SDN Data Plane.	**05**
b)	Discuss Openflow in detail with example.	**05**
c)	Explain Opendaylight architecture.	**05**
d)	Explain key elements in unified communication.	**05**
Q.3	Attempt **any two** of the following	**(10)**
a)	How SDN helps in working architecture of Cloud Computing?	**05**
b)	Explain the disadvantages of SDN Virtualization.	**05**
c)	State and Explain working of IoT Components with respect to Software Defined Networking	**05**
d)	Write a short note on NFV along with domain component.	**05**
Q.4	Attempt **any two** of the following	**(10)**
a)	Discuss BGP implementation with example.	**05**
b)	State and Explain MPLS implementation.	**05**
c)	Write a short note on Traffic filtering by Extended Access Control List.	**05**
d)	Explain Policy based routing in detail.	**05**
Q.5	Attempt **any two** of the following	**(10)**
a)	State and Explain the any five differences between LAN and MAN.	**05**
b)	What are different elements of Modern Technology? Explain any One in detail.	**05**
c)	Write a short note on Fog Computing.	**05**
d)	How does hello message help in OSPF?	**05**

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Time: 02 Hours **[Total Marks: 50]**

N.B: (1) **All questions are compulsory.**
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(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.
(5) **Draw suitable illustrations** wherever necessary.

Q.1	Attempt **any two** of the following	**(10)**
a)	Explain the concept of periodic signals. Provide examples of periodic signals and discuss their significance in digital signal processing.	**05**
b)	What is the difference between white noise, Brownian noise, pink noise, and Gaussian noise? What effect does noise have on signal and image processing?	**05**
c)	Define autocorrelation and explain its significance in signal and image processing	**05**
d)	Discuss the process of representing an image as a signal. How does sampling and the Fourier Transform contribute to this representation?	**05**
Q.2	Attempt **any two** of the following	**(10)**
a)	Define image processing and discuss its various applications in real-world scenarios. How does image processing enhance the quality and usability of images?	**05**
b)	Discuss intensity transformations in image processing. Explain the concepts of log transform, power-law transform, and contrast stretching with suitable examples.	**05**
c)	Describe the techniques used for linear and non-linear smoothing of images. How do these techniques differ in their approach to reducing noise and preserving image details?	**05**
d)	Define image derivatives and gradients. Explain the Laplacian operator and its role in edge detection.	**05**
Q.3	Attempt **any two** of the following	**(10)**
a)	Discuss the process of skeletonizing in morphological image processing. How does this technique reduce an image to its essential structure?	**05**
b)	Discuss the LoG (Laplacian of Gaussian) and DoG (Difference of Gaussian) filters. How are these filters used in edge detection, and what are their respective strengths and weaknesses?	**05**
c)	What are image pyramids, and why are they used in image processing? Explain the concepts of Gaussian Pyramid and Laplacian Pyramid.	**05**
d)	Define morphological image processing. Describe the operations of erosion and dilation and their effects on binary images.	**05**

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Q.4 Attempt **any two** of the following **(10)**

a) Describe the Harris Corner Detector. How does it detect corners in an image, and what makes it robust for corner detection? **05**

b) What is the Histogram of Oriented Gradients (HOG) method? Describe its application in feature extraction and object detection. **05**

c) Describe Haar-like features. How are these features used in object detection, particularly in the context of face recognition? **05**

d) Compare and contrast edge-based and region-based segmentation techniques. **05**

Q.5 Attempt **any two** of the following **(10)**

a) Compare and contrast the techniques of smoothing using lowpass filters and sharpening using high-pass filters. How does the Fast Fourier Transform (FFT) facilitate these operations? **05**

b) What is thresholding in image processing? Describe its importance and provide examples of how thresholding is used to segment images. **05**

c) What is the purpose of opening and closing operations in morphological image processing? Explain with suitable example. **05**

d) Explain the concept of Scale-Invariant Feature Transform (SIFT). How does SIFT achieve scale and rotation invariance in feature detection? **05**

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