

Research Methodologies

3/4/23

Instructions:

- 1) All questions are **compulsory**.
 - 2) Mixing of sub questions is not allowed.
 - 3) Write in clear, legible, writing.
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Q1) Attempt any four: (20)

- A) Explain the meaning and objective of research.
- B) Explain the term "Motivation in research".
- C) List and explain the different types of research
- D) Explain Descriptive research with example.
- E) Explain Action research with example.
- F) Write any two characteristics of good research.

Q2) Attempt any four: (20)

- A) What is sampling methods in research design?
- B) What are criteria for sampling design?
- C) Characteristics of good Sample design.
- D) What is Hypothesis? Explain the characteristics of good Hypothesis?
- E) Explain Type-I and Type-II Error in Hypothesis?
- F) What are Null Hypothesis and Alternative Hypothesis?

Q3) Attempt any four: (20)

- A) What is Research paper? What is the ethics in writing and publishing the research paper?
- B) What is a Scientific Paper? Explain with example.
- C) How to write title and abstract of a Research paper?
- D) How to write the Introduction? And Material and Method Selection in Research paper?
- E) How of write Acknowledgement and Cite and Reference in Research paper?
- F) How to design Effective Tables, Effective Graphs and Effective Photograph?

Q4) Attempt any five: (15)

- A) What point must be observed by a researcher in research problem?
- B) Explain the need of research design.
- C) What is the procedure for Hypothesis testing?
- D) Flow diagram of Hypothesis testing.
- E) How and when to use Abbreviations in Research paper?
- F) What is Ethical Issues in Research?

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Q1) Attempt any four: (20)

- A) State the difference between system software and application software.
- B) Explain the different phases of SDLC.
- C) Write a short note on different steps of waterfall model.
- D) Explain the capability maturity model in brief.
- E) What are the features of the spiral model?
- F) What is agility and what does the agile methods focus on.

Q2) Attempt any four: (20)

- A) Write a Short note on RAD Model.
- B) Discuss benefits of incremental process model.
- C) Explain the Evolutionary process model in details.
- D) What are the characteristics of a good software? Explain in brief.
- E) Explain the Architecture Design.
- F) Draw any 2 UML Diagram, label it and explain in brief.

Q3) Attempt any four: (20)

- A) Explain the basic principles of project scheduling.
- B) State the difference between quality assurance and quality control.
- C) Explain the COCOMO Model in brief.
- D) Write a short note on Extreme Programming.
- E) State the difference between coupling and cohesion.
- F) Write the difference between integration testing and regression testing.

Q4) Attempt any five: (15)

- A) Describe the quality criteria of a good software requirement specification(SRS).
- B) Distinguish between white box testing and black box testing.
- C) What is the need of user interface design. Explain in brief.
- D) Explain the difference between size oriented matrix and function oriented matrix.
- E) Write a brief note on software measurement and matrix.
- F) Explain the term "time boxing".

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Theory Of ComputationInstructions:

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Q1) Attempt any four: (20)

- A) Give the formal/mathematical specification of a DFA. Explain each term.
- B) Explain the specification of a Grammar. Give an example.
- C) For $\Sigma = \{a, b\}$, construct a DFA that accepts the sets consisting of all strings with no more than two a's.
- D) Construct a Moore Machine to compute the number of substrings of the form lab , that occur in an arbitrary input string, over the alphabet $\{a,b\}$ and output alphabet $\{0,1\}$.
- E) Design a DFA for the language $L = \{awa : w \in \{a, b\}^*\}$.
- F) Construct a CFG to generate the set of all balanced parenthesis over the alphabet $\Sigma = \{(,)\}$

Q2) Attempt any four: (20)

- A) Explain regular grammar and regular expression with examples.
- B) Explain pumping lemma and its steps for proving a language being not regular.
- C) Give the formal/mathematical specification of a PDA. Explain each term..
- D) Describe the following regular expression in English: $00^*11^*22^*$. Also give five strings from the above set.
- E) Remove all the null productions and rewrite the production rules: $S \rightarrow ABaC, A \rightarrow BC, B \rightarrow b, B \rightarrow \epsilon, C \rightarrow D, C \rightarrow \epsilon, D \rightarrow d$. Show all the steps.
- F) Remove all unit productions and rewrite the production rules: $S \rightarrow XY, X \rightarrow a, Y \rightarrow Z|b, Z \rightarrow m, M \rightarrow N, N \rightarrow a$. Show all the steps.

Q3) Attempt any four: (20)

- A) Give the formal/mathematical specification of a Turing machine. Explain each term.
- B) Explain the three components of a Turing machine with the help of a diagram.
- C) Design a TM that accepts the language of all strings, over the alphabet $\Sigma = \{a, b\}$, whose second letter is b .
- D) Explain the variants of the Turing machine.
- E) Design a TM that accepts the language of all strings of the form $a^n b^n$ for $n \geq 1$.
- F) Design a TM that erases all non-blank symbols on the tape, over the alphabet $\Sigma = \{a, b\}$.

Q4) Attempt any five: (15)

- A) Explain with example a state transition diagram.
- B) Give the Chomsky classification of Grammar/Language.
- C) What are context-free grammar and language? Give examples.
- D) State the Church-Turing thesis.
- E) Explain the halting problem.
- F) What do you mean by unit production? Give examples.

IOT Technologies

Instructions:

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Q1) Attempt any four: (20)

- A) Define and explain IoT.
- B) Explain IoT characteristics.
- C) Write a short note on IoT protocols.
- D) Write a short note on Low-power WANS (LPWANS).
- E) Write a short note on LWM2M (Lightweight M2M).
- F) Compare LPWANS and LWM2M.

Q2) Attempt any four: (20)

- A) What are the reasons for lack of IoT security?
- B) Write python program for controlling LED with switch.
- C) List features of UART.
- D) Compare SPI and I2C.
- E) How different sensors can be interfaced with IoT devices.
- F) What are the considerations while selecting sensor for particular application E.g: weather monitoring.

Q3) Attempt any four: (20)

- A) List the applications of IoT.
- B) Why would someone opt for Fog computing?
- C) List the communication protocols.
- D) Mention the methodologies for IoT application.
- E) Compare cloud computing and Fog computing.
- F) Define IoT levels.

Q4) Attempt any five: (15)

- A) Explain MQTT Protocol in Brief.
- B) Explain XMPP Protocol in Brief.
- C) Write in Brief About IOT History.
- D) Explain About Different Raspberry Model's.
- E) What is NodeRed.
- F) WSN Architecture and its different types.

Advanced Application Development**Instructions:**

- 1) All questions are **compulsory**.
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Q1) Attempt any four: (20)

- A) Draw the diagram showing the components of basic website/web application.
- B) Explain the advantageous features of Node.js.
- C) List five built-in modules of Node.js, describing each briefly.
- D) Explain the features of MongoDB for web applications.
- E) Explain documents and collections in MongoDB with examples.
- F) How do you create and delete databases in MongoDB? Give examples for each.

Q2) Attempt any four: (20)

- A) Describe the various features of Express.
- B) How do you implement a basic web server using Express? Give an example.
- C) Explain with an example, how static files are served in Express.
- D) What is Angular? Explain its various features.
- E) Briefly explain Component with reference to Angular.
- F) Explain the structural directive *ngFor* with an example.

Q3) Attempt any four: (20)

- A) Explain the various data types in Dart.
- B) Explain the 'forEach' loop with an example.
- C) Explain lexical scope in Dart with an example.
- D) Explain Widgets in Flutter.
- E) Explain the widget types.
- F) Explain the scaffold widget.

Q4) Attempt any five: (15)

- A) Explain how to convert a javascript object to a JSON string with an example.
- B) Explain the way of querying MongoDB with an example.
- C) With the help of an example show the handling of POST data using Express.
- D) Explain the structural directive *ngIf* with an example.
- E) Explain named constructors in Dart with examples.
- F) Explain hot reload and hot restart.

Android Application Development**Instructions:**

- 1) All questions are compulsory.
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 - 3) Write in clear, legible, writing.
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Q1) Attempt any four: (20)

- A) What are the rules for naming Kotlin variables?
- B) Explain the following Kotlin operators:-Arithmetic, Comparison
- C) Explain any three operations in relation to Kotlin arrays
- D) What are intents? What are its types? Explain each with suitable example
- E) Draw and Explain the Lifecycle of an Activity
- F) Explain any three different operations that can be performed on a String variable in Kotlin

Q2) Attempt any four: (20)

- A) What is an Android menu? What are its types? How do you create a menu in an XML file?
- B) Explain the Spinner and how to create and use it
- C) Explain the AutoCompleteTextView and how to create and use it
- D) How do you handle Button click event? Explain
- E) Explain the following types of Android Views:- TextView, EditText
- F) How do you create styles for UI controls? Explain

Q3) Attempt any four: (20)

- A) Explain the Android MediaPlayer API through an example
- B) How to create Animations in Android? Explain through an example
- C) Explain the process of stopping a service
- D) What are Broadcast Receivers? How do you create broadcast receivers? Explain through an example
- E) Explain the lifecycle of a Started Service
- F) What are Services? What are its two types?

Q4) Attempt any five: (15)

- A) Explain the following Kotlin When Expression
- B) Explain the following types of Android Views:-RadioGroup, RadioButton
- C) Explain the process of starting a service
- D) Explain the following datatypes of Kotlin:- Boolean, String
- E) Explain the Context menu in android and how to create and use them
- F) How do you write comments in a Kotlin program?

Computer NetworkInstructions:

- 1) All questions are compulsory.
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Q1) Attempt any four: (20)

- A) . Explain the types of Computer Networks.
- B) . Explain the TCP/IP model in detail.
- C) . What is multiplexing? What are its types? Explain In detail.
- D) . Explain the transmission media and the difference between the guided media.
- E) . Difference between following
 - a. Amplitude modulation, and Frequency modulation
 - b. Connectionless and Connection-Oriented
- F) . Write short notes (Any Two)
 - a. Ring Topology
 - b. Digital to Analog Conversion.
 - c. Full duplex Transmission mode.

Q2) Attempt any four: (20)

- A) . What are the Services of the Data Link Layer?
- B) . Write a short note on Framing and explain any framing methods with examples.
- C) . List the different error correction techniques. Explain to anyone in detail with examples.
- D) . Describe checksum computation at the sender and receiver sides. If the data unit to be transmitted is 10101001 00111001, and data is received at the receiver side.

1010001	00111001	00011101
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Data

Checksum

- E) . What is HDLC? What are the different types of frames in HDLC? Explain the different fields in HDLC frames.
- F) . Write a short note on Any two.
 - a. Virtual LAN
 - b. Bluetooth
 - c. Pure Aloha
 - d. NIC

Q3) Attempt any four: (20)

- A) . What is the dynamic host configuration protocol? Explain the DHCP message format.
- B) . What is routing information protocol? Explain the RIP algorithm.
- C) . Explain the services provided by Transport Layer.
- D) . Compare the following
 - a. OSPF and RIP
 - b. Bridge and Gateway
- E) . Explain the architecture of WWW.
- F) . Explain traffic shaping and also explain the different traffic shaping algorithm.

Q4) Attempt any five:

(15)

- A) . What is the working of Two-Dimensional Parity check bit methods? Explain with a suitable example.
- B) . Explain data communication & where we are using it.
- C) . List and explain on signal & types of signals.
- D) . Explain encoding decoding techniques of CRC.
- E) . Difference between the following (Any Two)
 - a. Hub and Switch
 - b. TCP and UDP
 - c. Different Transmission modes.
- F) . Write a short note on the ipv4 and ipv6.