

Total No. of Questions : 4]

SEAT No. :

PD-554

[Total No. of Pages : 3

[6471]-31
S.Y. B.C.A. (Science)
BCA - 231 : DATA STRUCTURES
(2019 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat sketches wherever necessary to illustrate the answer.*
- 4) *Each question carries equal marks.*

Q1) Attempt the following :

[5 × 1 = 5]

A) Choose the correct option :

- i) When the user tries to delete the element from the empty stack then the condition is said to be a _____
 - a) Underflow
 - b) Garbage collection
 - c) Overflow
 - d) None of the above
- ii) In balanced binary tree the height of two subtree of every node can not differ by more than _____
 - a) 2
 - b) 1
 - c) 3
 - d) None of the above
- iii) _____ data structures do we use for testing a polindrome?
 - a) Heap
 - b) Tree
 - c) Priority queue
 - d) Stack
- iv) _____ is the time complexity for checking if an undirected graph with E edges and V vertices is Bipartite, give its adjaency matrix?
 - a) $O(E)$
 - b) $O(V)$
 - c) $O(E * E)$
 - d) $O(V * V)$
- v) _____ is the time complexity to count the number of elements in the linked List.
 - a) $O(1)$
 - b) $O(n)$
 - c) $O(\log n)$
 - d) $O(n^2)$

P.T.O.

B) Answer the following :

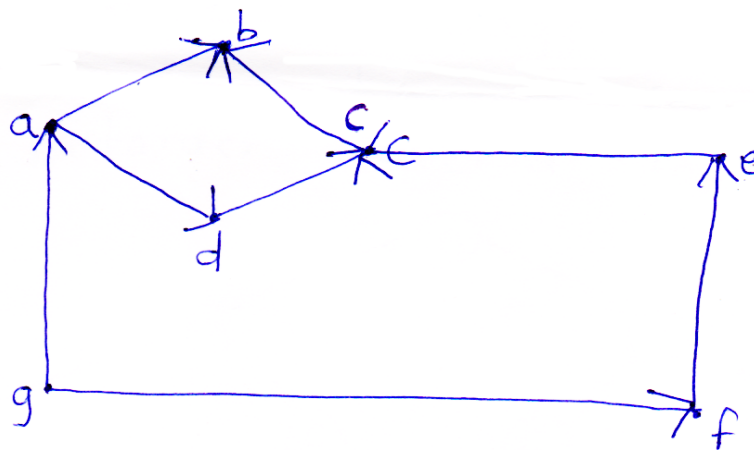
[5 × 1 = 5]

- i) What is Linked list?
- ii) Define Data structures.
- iii) What is priority Queue?
- iv) List the few application of graph data structure.
- v) What is complete Binary tree?

Q2) Answer the following. (Any five) :

[5 × 3 = 15]

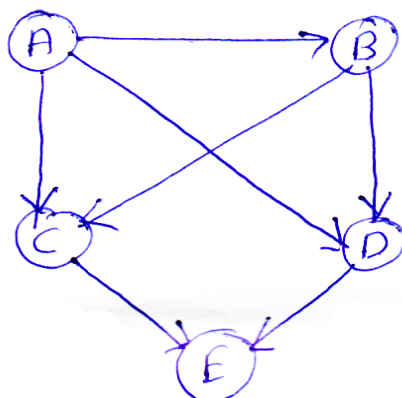
- a) Create a Binary Search Tree for the following data.
45, 15, 79, 90, 10, 55, 12, 20, 50
- b) Differentiate between stack and Queue.
- c) Write a note on Best, worst and average case analysis.
- d) Write an algorithm for Binary Search.
- e) Define stack with it's operations.
- f) What is Graph? Find Indegree and outdegree of the following Graph.



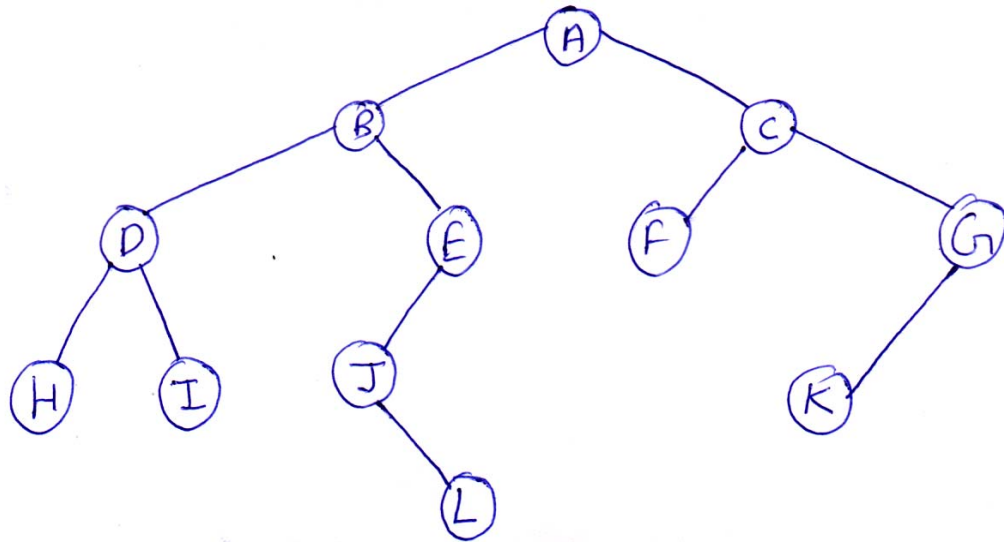
Q3) Answer the following. (Any five) :

[5 × 4 = 20]

- a) Find the number of different topological orderings possible for the given graph.



- b) Sort the following data using merge sort.
A[7] = {38, 27, 43, 3, 9, 82, 10}
- c) Write an algorithm of Insertion sort.
- d) Write a note on DFS Algorithm.
- e) What is Queue? Explain types of Queue.
- f) Write a function to implement Bubble sort in C language.
- g) Define tree traversal. Find inorder, preder and postorder traversal for the following tree.



Q4) Answer the following. (Any five) :

[5 × 5 = 25]

- a) What is Array? Explain memory representation of an array.
- b) Write a C function to implement linear search.
- c) What is Graph? Explain its representation.
- d) Define Linked list? Explain types of Linked list.
- e) Solve the following
 - i) Convert Infix to Postfix expression
 $K + L - M * N + (O \wedge P) * W / U / V * T + Q$
 - ii) Convert postfix to infix expression $A B + C + D +$
- f) Write a function to create and insert node for singly linked list.
- g) Write an algorithm for Enqueue and Dequeue operation.



Total No. of Questions : 4]

SEAT No. :

PD-555

[Total No. of Pages : 4

[6471]-32

S.Y.B.C.A. (Science)

**BCA - 232 : DATABASE MANAGEMENT SYSTEM - II
(2019 Pattern) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat sketches wherever necessary to illustrate answer.*

Q1) A) Attempt the following :

[5 × 1 = 5]

- i) Which of the following is used to declare a record?
 - a) % Rowtype
 - b) % Type
 - c) Both a and b
 - d) % Row
- ii) Which of the following is not a transaction state?
 - a) Active
 - b) Partially committed
 - c) Failed
 - d) Compensated
- iii) A logical counter is after a new timestamp has been assigned _____
 - a) Incremented
 - b) Decremented
 - c) Doubled
 - d) Remains the same
- iv) The log is a sequence of _____ recording all the update activities in the database.
 - a) Records
 - b) Log records
 - c) Redo
 - d) Entries
- v) In client/server architecture _____ requests a resource.
 - a) Client
 - b) Server
 - c) Processor
 - d) Client and server

B) Answer the following :

[5 × 1 = 5]

- i) List the types of distributed databases.
- ii) Define the term database security.
- iii) Enlist various types of errors.
- iv) What is a lock?
- v) Define concurrent schedule.

P.T.O.

Q2) Answer the following. (Any five) :

[5 × 3 = 15]

- a) Explain different data types in PLPgSQL.
- b) Explain cascadeless schedule and recoverable schedule.
- c) What is multiple granularity?
- d) What is the relationship between Recovery manager and Buffer management?
- e) Write a note on statistical database security.
- f) What is distributed database system?

Q3) Answer the following. (Any five) :

[5 × 4 = 20]

- a) Consider the following Entities and their Relationships for student - Marks database.
Student (rollno integer, S-name varchar (20), address varchar (25), class varchar (10))
Subject (Scode varchar (10), subject - name varchar (20))
Relationship between student and subject is many to many with descriptive attribute marks-scored.
Constraints : primary key,
s-name should not be null
Create view for the following :
 - i) To display student name, class and total marks scored by each student, sorted by student name.
 - ii) To display student names along with subject and marks who has scored more than 80 marks.
- b) Explain client/server system architecture.
- c) Explain how DBA is responsible for managing database security? What are the privileged commands used by DBA?
- d) Explain log based recovery.
- e) Explain the two-phase locking protocol.
- f) Consider the following transactions. Given two non serial schedules that are serializable to serial schedule $\langle T_1, T_2 \rangle$

T_1	T_2
Read (c)	Read (c)
Read (a)	Read (a)
$a = a - c$	$a = a + c$
write (a)	write (a)
Read (b)	
$b = b - c$	
write (b)	

- g) What is a cursor? How to declare it? Explain with example.

Q4) Answer the following. (Any five) :

[5 × 5 = 25]

a) Example :

Consider the following Entities and their Relationships for Railway reservation database.

Train (tno int, tname varchar (20), depart - time time, arrival - time time, source - stn char (10), dest - stn char (10), no - of, res – bogies int, bogie - capacity int)

Passenger (passenger - id int, passenger - name varchar (20), address varchar (30), age int, gender char)

Relationship between Train and passenger is many to many with descriptive attribute ticket.

Ticket (train - no int, passenger - id int, ticket - no int, bogie - no int, no - of berths int, tdate date, ticket - amt decimal (7,2), status char)

Constraints : primary key

status of a berth can be 'w' (waiting) or 'c' (confirmed)

- i) Create view for to list the two bookings of 'sahyadri Express' on date '11-10-2017'.
 - ii) Write a stored function to accept date and passenger name and display no of berths reserved and ticket amount paid by him/her.
- b) Example : check whether the given schedule s is conflict serializable or not-
- S: $R_1(A)$, $R_2(A)$, $R_1(B)$, $R_2(B)$, $R_3(B)$, $W_1(A)$, $W_2(B)$
- c) Explain conflict serializable schedule with example.
 - d) Explain the life cycle of transaction with diagram.
 - e) Following is the list of events in an interleaved execution of set T_1 , T_2 and T_3 assuming 2 PL (Two phase protocol). Is there a deadlock? If yes, which transactions are involved in deadlock?

Time	Transaction	Code
t_1	T_1	Lock (A,X)
t_2	T_2	Lock (B,S)
t_3	T_3	Lock (A,S)
t_4	T_1	Lock (C,X)
t_5	T_2	Lock (D,X)
t_6	T_1	Lock (D,S)
t_7	T_2	Lock (C,S)

- f) What are the different deadlock prevention algorithms. Explain in detail.
- g) Following are the log entries at the time of system crash :
- [start - transaction, T_1]
 - [write - item, T_1 , A, 10, 100]
 - [commit, T_1]
 - [check point]
 - [start - transaction, T_2]
 - [write - item, T_2 , B, 20, 200]
 - [commit, T_2]
 - [start - transaction, T_3]
 - [write - item, T_3 , c, 30, 300] system crash
- If immediate update technique with a checkpoint is used, what will be the recovery procedure?



Total No. of Questions : 4]

SEAT No. :

PD-556

[Total No. of Pages : 3

[6471]-33

S.Y.B.C.A.

SCIENCE

BCA - 233 : Computer Networks

(2019 Pattern) (Semester -III)

Time : 3 Hours]

[Max. Marks : 70

Instruction to the candidates :

- 1) Figures to the right indicate full marks.
- 2) All questions are compulsory.
- 3) Draw diagram whenever necessary.

Q1) Attempt the following:

A) Choose the correct option.

[5×1=5]

- a) The _____ field determines the lifetime of IPv6 datagram.
 - i) TTL
 - ii) Next header
 - iii) Checksum
 - iv) Hop limit
- b) Electronic mail uses _____ application layer protocol.
 - i) FTP
 - ii) SMTP
 - iii) TCP
 - iv) HTTP
- c) _____ of the following tasks is not done by data link layer
 - i) Routing
 - ii) Framing
 - iii) Error control
 - iv) Flow control
- d) Bipolar encoding involves _____ signal levels.
 - i) Five
 - ii) Four
 - iii) Three
 - iv) Two
- e) The first operational computer network in world was _____.
 - i) ARPANET
 - ii) ERNET
 - iii) SKYNET
 - iv) DRPANET

P.T.O.

B) Answer the following: [5×1=5]

- a) What is meant by well known ports?
- b) Enlist random access methods.
- c) Write address mask for /24.
- d) UDP is faster than TCP. State true or false.
- e) Enlist causes of signal impairments.

Q2) Answer the following : (Any Five) [5×3=15]

- a) Write note on NAT.
- b) Explain different types of server used in DNS.
- c) Explain frequency division multiplexing.
- d) What is meant by controlled access? Explain methods.
- e) Write note on encapsulation.
- f) What are uses of computer network in home application?

Q3) Answer the following (Any Five). [5 × 4 = 20]

- a) Explain selective repeat protocol with advantage and disadvantage.
- b) Explain the services provided by transport layer.
- c) Write note on classless addressing.
- d) Explain the characteristics for line coding schemes.
- e) Explain different levels of address used in network.
- f) Define data communication. Describe component of data communication with diagram.
- g) For given IP address 205.16.37.39/28 in some block of address. Calculate
 - i) address mask
 - ii) first address of block
 - iii) last address of block
 - iv) number of address in block

Q4) Answer the following (Any Five)

[5 × 5 = 25]

- a) Explain TCP segment format.
- b) Describe the different scenario in email process.
- c) Draw the structure of IPv4 datagram and explain.
- d) Explain criteria for measuring network performance.
- e) Write note on ISO-OSI reference model.
- f) Differentiate between LAN, MAN and WAN.
- g) Given 12 bit sequence 110111011001 and divisor of 1011. Find CRC and transmitted data.



Total No. of Questions : 4]

SEAT No. :

PD-557

[Total No. of Pages : 4

[6471]-41

S.Y.B.C.A.

SCIENCE

**BCA - 241 : Object Oriented Programming and C++
(2019 Pattern) (Semester -IV)**

Time : 3 Hours]

[Max. Marks : 70

Instruction to the candidates :

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat sketches whenever necessary to illustrate answer.*
- 4) *Each question carry equal marks.*

Q1) A) Choose the correct option

[5×1=5]

- a) What does # include means in C++ programs?
 - i) It's a directive.
 - ii) It is used for copy & import.
 - iii) It causes the contents of a second file to be inserted into the original file.
 - iv) All of them.
- b) _____ are basic runtime entities.
 - i) data
 - ii) classes
 - iii) objects
 - iv) none

P.T.O.

- c) _____ is default namespace defined by C++
- i) using
 - ii) include
 - iii) std
 - iv) none of these
- d) Whenever an object is destroyed _____ function is called.
- i) destructor
 - ii) constructor
 - iii) copy constructor
 - iv) default constructor
- e) _____ function is used to reach end of file
- i) exit ()
 - ii) close ()
 - iii) eof ()
 - iv) both i) & iii)

B) Answer the following:

[5×1=5]

- a) List the applications of OOP.
- b) Define Linking
- c) Define Type casting
- d) What is Dynamic constructor
- e) What are the types of polymorphism

Q2) Answer the following (Any Five)

[5×3=15]

- a) Define Inheritance. Give it's advantages.
- b) Explain new & delete operators with example.
- c) What are the types of files.
- d) Write a C++ program for opening two files with same stream & storing the content in it.
- e) State the rules for operator overloading.

- f) Trace the output for below code. (Assume no syntax errors)

Class A

```
{
    Public :
        A ()
        { cout << "\n object created";
        }
        ~ A ()
        { cout << "\n object destroyed";
        }
};

A a1;
main ()
{   Aa2;
    { Aa3;
    }
    exit (0);
}
```

Q3) Answer the following (Any Five).

[5 × 4 = 20]

- a) Explain the use of below:
 - i) try block
 - ii) throw statement
- b) Explain pure virtual function with suitable example.
- c) Write a C++ program to declare "amount" as classname with data members p,r &y. Accept values for one object & find out simple interest.
- d) Explain manipulators used in C++.
- e) What is friend function? Give its features.
- f) Write a C++ program to read data members of Base class as-name, pid. And derived class members are height & wt. Display the data of person.
- g) Explain scope resolution operator with example.

Q4) Answer the following (Any Five)

[5 × 5 = 25]

- a) State advantages of OOPs.
- b) Write this pointer in detail.
- c) Which are the two ways of defining member function. Explain any one with suitable example & its syntax.
- d) Define constructor. Explain copy & Dynamic constructor in detail.
- e) Write a C++ program to accept three book details like bno, bname, aname & cost using accept () & display () functions for demonstrating array of objects.
- f) Explain different types of Inheritance with example.
- g) Write a C++ program for the unary minus operator over loading concept.



Total No. of Questions : 4]

SEAT No. :

PD-558

[Total No. of Pages : 3

[6471]-42

S.Y. B.C.A. (Science)

BCA 242 : WEB TECHNOLOGY

(2019 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat daigram wherever necessary.*

Q1) A) Choose the correct option :

[5 × 1 = 5]

- i) The _____ function is used to check whether the given value is a string or not.
 - a) is_str()
 - b) chk_string()
 - c) is_string()
 - d) check_string()
- ii) Which keyword is used to refer to properties or methods within the class itself?
 - a) \$this
 - b) private
 - c) public
 - d) protected
- iii) Which two predefined variables are used to retrieve information from forms?
 - a) \$GET & \$SET
 - b) GET & SET
 - c) \$_GET & \$_SET
 - d) \$_GET & SET
- iv) AJAX stands for _____
 - a) Another Java Abstraction for X-Window
 - b) Asynchronous Javascript and XML
 - c) Abstract JSON and XML
 - d) Another Java and XML Library
- v) Who developed PHP?
 - a) Guido van Rossum
 - b) Rasmus Lerdorf
 - c) Jesse James Garrett
 - d) Douglas Crockford

P.T.O.

B) Answer the following :

[5 × 1 = 5]

- i) Define encapsulation.
- ii) What is an anonymous function?
- iii) State True/False. “Cookie is stored at server side”.
- iv) State the syntax of pg_connect() function.
- v) What will be the output of following code

```
<?php
```

```
$city = array (“Pune”, “Nasik” “Mumbai”, “Nagpur”);
```

```
echo (array_search (“Mumbai”, $city) );
```

```
?>
```

Q2) Answer the following (Any five) :

[5 × 3 = 15]

- a) What are the features of HTTP?
- b) Explain the working of list() function.
- c) What are the disadvantages of AJAX?
- d) Write short note on prepare () and execute ().
- e) Write a PHP program to check whether a given number is even or odd.
- f) Write the characteristics of an interface.

Q3) Answer the following (Any five) :

[5 × 4 = 20]

- a) Differentiate between for loop and foreach loop.
- b) Write a PHP script to define a class Employee with emp_code, emp_name and emp_designation as data members. Define constructor and destructor for the class. Also define display() function to display employee details.
- c) Explain how to maintain state in PHP?
- d) Write a PHP script to keep track of number of times the web page has been access. [Use Session]
- e) Explain AJAX web application model with diagram.
- f) What are the steps to open and interact with a database in PHP?
- g) Differentiate between GET and POST method.

Q4) Answer the following (Any five) :

[5 × 5 = 25]

- a) Explain different parameters used for \$_SERVER information.
- b) Write a PHP program which accepts the department name from user and displays the highest, lowest and total salary paid to the employees in that specific department in tabular format. Consider the following tables for this
dept(deptno, deptname, location)
emp(empno, empname, addr, phno, sal, deptno)
- c) Explain data types in PHP in detail.
- d) What is inheritance? Explain with suitable example.
- e) Write a PHP script to display reverse of a given number.
- f) Explain array_splice() function with example.
- g) Write AJAX program to carry out validation for a username entered in textbox. If the textbox is blank, print 'Enter username'. If the number of a characters is less than three, print 'Username is too short'. If value entered is appropriate the print 'Valid username'.



Total No. of Questions : 4]

SEAT No. :

PD-559

[Total No. of Pages : 3

[6471]-43

S.Y. B.C.A. (Science)

BCA 243 : SOFTWARE ENGINEERING

(2019 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat diagram wherever necessary.*

Q1) A) Choose the correct option :

[5 × 1 = 5]

- a) The system which is directly interacting with the environment is known as?
 - i) Abstract System
 - ii) Open System
 - iii) Closed System
 - iv) Transaction Processing System
- b) A system is a collection of components that work together to achieve a_____.
 - i) Speed
 - ii) Common goal
 - iii) Collaboration
 - iv) Limit
- c) What is the first phase of SDLC?
 - i) Design
 - ii) Requirement Analysis
 - iii) Implementation
 - iv) Testing
- d) Which of the following techniques is commonly used for requirement elicitation?
 - i) Coding
 - ii) Debugging
 - iii) System Testing
 - iv) Interviews and Surveys
- e) What is Data Flow Diagram (DFD) used for in system analysis?
 - i) To represent how data moves through a system
 - ii) To describe system security features
 - iii) To write the system's source code
 - iv) To define the programming language to be used

P.T.O.

B) Answer the following :

[5 × 1 = 5]

- a) What is software?
- b) What are the basic components of a system?
- c) What is elaboration?
- d) What is SRS?
- e) Define agility.

Q2) Answer the following (Any five) :

[5 × 3 = 15]

- a) What are the elements of any system?
- b) What are the characteristics of Software? Explain.
- c) Which are the types of feasibility?
- d) What is coupling? Explain any two types in detail.
- e) What are the advantages and disadvantages of the waterfall model?
- f) What is a data dictionary? Explain its types.

Q3) Answer the following (Any five) :

[5 × 4 = 20]

- a) Explain any four umbrella activities.
- b) What is the need of requirement engineering?
- c) What is the difference between verification and validation?
- d) What is DFD? Enlist and specify the purpose of Symbols used in DFD.
- e) Explain different fact finding techniques in detail.
- f) Write a short note on Extreme programming values.
- g) What are the human factors for agile software development?

Q4) Answer the following (Any five) :

[5 × 5 = 25]

- a) Describe the objectives of input design and output design.
- b) Draw context level and 1st level DFD for “Airline Reservation System”.
- c) What is requirement gathering? Explain.
- d) Explain ASD life cycle.
- e) Differentiate between spiral model and prototype model.
- f) Explain any five principles of the Agile process.

- g) Consider the following case study. A loan company uses the following rules to determine if a person is eligible for a loan:
- i) The person will be eligible for a loan if:
 - 1. They have a credit score of 700 or higher.
 - 2. They have a credit score of less than 700 and are employed full-time.
 - ii) If the person has a credit score of less than 700, and they are not employed full-time, they will not be eligible for loan.
 - iii) If the person is employed part-time, they are not eligible for a loan, regardless of their credit score.
 - iv) If the person has a credit score of 700 or higher and has a steady source of income, they will be eligible for a loan even if they are not employed full-time.
 - v) If the person is a student, they are not eligible for a loan, regardless of their credit score or employment status.

Draw the decision tree based on the above rules given for determining loan eligibility.



Total No. of Questions : 4]

SEAT No. :

PD560

[6471]-51

[Total No. of Pages : 3

T.Y.B.C.A. (Science)

**BCA- 351-DSE-I : PROGRAMMING IN JAVA
(2019 Pattern) (Semester -V)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer all questions.**
- 2) Figures to the right indicate full marks.**
- 3) Draw diagram wherever necessary.**

Q1) Attempt the following:

[5 ×1=5]

A) Choose the correct option.

- a) To create a menu user need to use _____ class.
 - i) JRadio Button
 - ii) JFrame
 - iii) JMenu
 - iv) None of the mentioned
- b) Which of these interface must contain a unique element?
 - i) Set
 - ii) List
 - iii) Array
 - iv) Collection
- c) Which method is used to perform DML statements in JDBC?
 - i) execute ()
 - ii) execute Query ()
 - iii) execute Update ()
 - iv) execute Result ()
- d) Which of these packages contain all the java's built-in exceptions.
 - i) java . io
 - ii) java . util
 - iii) java . lang
 - iv) java . net
- e) In java servlet method init () is called _____ times.
 - i) 1
 - ii) 2
 - iii) 0
 - iv) multiple

P.T.O.

B) Answer the following [5 ×1=5]

- a) What is Interface?
- b) Define class.
- c) What is swing?
- d) What is use of execute Query ()?
- e) Enlist JDBC drivers.

Q2) Answer the following: (Any Five) [5×3=15]

- a) Explain four features of java.
- b) Write a note on Byte stream.
- c) What is method overloading?
- d) Explain MVC architecture.
- e) Explain HTTP Request & HTTP Response.
- f) Describe JDBC-ODBC bridge driver.

Q3) Answer the following: (Any Five) [5×4=20]

- a) Explain Generic servlet & HHP servlet.
- b) What are JSP implicit objects?
- c) Explain Applet Life Cycle.
- d) What is Exception? Explain checked exception.
- e) Explain extend key word with example.
- f) Explain Linked List class with example.
- g) Differentiate between string & string bulfer.

Q4) Answer the following: (Any Five)

[5×5=25]

- a) Explain following terms
 - i) throws ii) try iii) catch iv) finally
- b) Write JDBC Program to create student table into the database & closes the connection.
- c) Explain types of Layout managers.
- d) Explain JDBC Architecture in detail.
- e) With the help of diagram explain servlet life cycle.
- f) Write java program to accept number from user, if number is zero then throw user defined exception “Number is 0” otherwise check whether number is prime or not.
- g) Explain JSP life cycle in detail.



Total No. of Questions : 4]

SEAT No. :

PD561

[Total No. of Pages : 2

[6471]-52

T.Y. B.C.A.

SCIENCE

BCA-352-DSE-II : Data Mining and Data Science

(2019 Pattern) (Semester - V)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw labeled diagram wherever necessary.*
- 3) *Figures to the right indicates full marks.*

Q1) Attempt the following :

[5×1=5]

A) Choose the correct option :

- a) In classification _____ are used to estimate the accuracy of classification rules.
 - i) Training data
 - ii) Data base
 - iii) Test data
 - iv) Label attributes
- b) Cluster is
 - i) Group of similar objects that differ from other objects
 - ii) Symbolic representation of facts
 - iii) Operations on a database to simplify data
 - iv) A relational database as a set of entities
- c) In _____ multiple fact tables share the same dimension tables.
 - i) Star schema
 - ii) Snowflake schema
 - iii) Fact constellation schema
 - iv) All of above
- d) Which method shows hierarchical data in a nested format?
 - i) Tree maps
 - ii) Scatter plots
 - iii) Population pyramids
 - iv) Area charts
- e) Which are specific examples of methods to visualize data?
 - i) Bubble cloud
 - ii) Area chart
 - iii) Dot distribution map
 - iv) All of the above

B) Attempt the following :

[5×1=5]

- a) What is data science?
- b) What is frequent item set?
- c) What is regression?
- d) What is Data Mart?
- e) What is binning?

P.T.O.

Q2) Answer the following (Any five)

[5×3=15]

- a) Explain data discretization.
- b) Explain different types of schemes in data warehouse.
- c) Explain SVM classifiers.
- d) What is statistical model? Explain it's types.
- e) Describe benefits of data visualization.
- f) Explain problems occur while clustering.

Q3) Answer the following. (Any five)

[5×4=20]

- a) Explain any two OLAP operations with example.
- b) Explain machine learning.
- c) Explain Rule-Based Classification.
- d) What is probability distribution? Explain any four types of it.
- e) Differentiate between Data Science and Data analytics.
- f) Explain various tools for data visualization.
- g) Explain K-means technique.

Q4) Answer the following. (Any five)

[5×5=25]

- a) Explain steps of KDD process in detail.
- b) Explain types of Exploratory Data Analysis.
- c) Consider the following set of transactions.

<u>TID</u>	<u>Items</u>
T ₁	I ₁ , I ₂ , I ₅
T ₂	I ₂ , I ₄
T ₃	I ₂ , I ₃
T ₄	I ₁ , I ₂ , I ₄
T ₅	I ₁ , I ₃
T ₆	I ₂ , I ₃
T ₇	I ₁ , I ₃
T ₈	I ₁ , I ₂ , I ₃ , I ₅
T ₉	I ₁ , I ₂ , I ₃

Minimum support count = 2

Apply apriori algorithm and Find frequent item sets.

- d) Explain linear and non linear regression.
- e) What is cluster? Explain types of clustering algorithm.
- f) Give applications of data science in various fields
- g) Explain data mining techniques in brief.



Total No. of Questions : 4]

SEAT No. :

PD562

[Total No. of Pages : 3

[6471]-53

T.Y. B.C.A. (Science)

**BCA-353-DSE-III : PRINCIPLES OF OPERATING SYSTEMS
(2019 Pattern) (Semester - V)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw labeled diagram wherever necessary.*
- 3) Figures to the right indicates full marks.*

Q1) Attempt the following :

[5×1=5]

A) Choose the correct option :

- a) The process which are blocked due to unavailability of an I/O device constitute this queue.
 - i) Process scheduling queue
 - ii) Job queue
 - iii) Ready queue
 - iv) Device queue
- b) In a time-sharing operating system, when the time slot given to a process is completed, the process goes from running state to the
 - i) Blocked state
 - ii) Ready state
 - iii) Suspended state
 - iv) Terminated state
- c) Which of the following is dead lock avoidance algorithm?
 - i) Banker's algorithm
 - ii) Round-robin algorithm
 - iii) Elevator algorithm
 - iv) Karn's algorithm
- d) For direct access file
 - i) There are restriction on the order of reading & writing
 - ii) There is no restriction on order of reading & writing
 - iii) Access is restricted permission wise
 - iv) Access is not restricted permission wise
- e) With round robin scheduling algorithm in time shared system _____
 - i) Using very large time slices converts it into FIFO scheduling algorithm
 - ii) Using very small time slices convert it into FIFO scheduling of algorithm
 - iii) Using extremely small time slices increases performance
 - iv) Using very small time slices converts it into SJF algorithm

P.T.O.

- B) Attempt the following : [5×1=5]
- a) Define system table
 - b) What is ready queue?
 - c) What is parent process?
 - d) What is mutual exclusion?
 - e) What is single level directory?
 - f) What is dynamic loading?

Q2) Answer the following (Any five) [5×3=15]

- a) Write short note on process termination.
- b) Explain working of memory management unit in short.
- c) State the necessary conditions for deadlock to occur.
- d) What is spooling?
- e) Discuss the requirements of critical problem solution.
- f) Write note on I/O scheduler.

Q3) Answer the following. (Any five) [5×4=20]

- a) Explain tree structure directory structure.
- b) Write note on virtualization
- c) Let the reference be 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5. Use FIFO algorithm to find the no. of page faults :
 - i) When there are 3 frames
 - ii) When there are 4 frames
- d) Differentiate between contiguous allocation & linked allocation method of disk space.
- e) Discuss the symbols used for representation of resource allocation graph.
- f) What is semaphores? Discuss its type.
- g) Write short note on polling.

Q4) Answer the following. (Any five)

[5×5=25]

- a) Consider the following diagram of system. A system has 5 processes P_1 through P_5 & 3 resources A, B, C.

Processes	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_1	0	1	0	7	5	3	3	3	2
P_2	2	0	0	3	2	2			
P_3	3	0	2	9	0	2			
P_4	2	1	1	2	2	2			
P_5	0	0	2	4	3	3			

Answer the following questions using Banker's algorithm: If the system is in safe state give the safe sequence.

- b) Let the reference string be 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults will occur for the following page replacement algorithms, assuming 4 frames for all initially empty
- Optimal replacement
 - LRU
 - FIFO page replacement algorithm
- c) What is swapping? Explain demand paging with example.
- d) Why SSTF disk scheduling algorithm is better than FCFS scheduling algorithm provide example.
- e) Explain tree-structure directory structure with example.
- f) Write a short note on pre-emptive scheduling.
- g) Describe perterson's solution to solve critical section problem.



Total No. of Questions : 5]

SEAT No. :

PD563

[Total No. of Pages : 3

[6471]-54
T.Y.B.C.A.
SCIENCE
BCA-354-SEC - I : Artificial Intelligence
(2019 Pattern) (Semester - V)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw labeled diagram wherever necessary.*

Q1) Attempt any EIGHT of the following. (Out of TEN) **[8×1=8]**

- a) The application/applications of Artificial Intelligence is/are _____.
 - i) Expert Systems
 - ii) Gaming
 - iii) Vision Systems
 - iv) All of the above
- b) Which search method takes less memory?
 - i) Depth-first search
 - ii) Breadth-first search
 - iii) Linear search
 - iv) Optimal search
- c) Which of the following problems can be modeled as CSP?
 - i) 8-Puzzle Problem
 - ii) 8-Queen Problem
 - iii) Map Coloring Problem
 - iv) All of the above
- d) For propositional Logic, which statement is False?
 - i) Can have answer other than true or false
 - ii) Each sentence is declarative sentence
 - iii) It is a knowledge representation technique in AI
 - iv) None of the above
- e) A _____ is a structure that prescribes a set of circumstances that could be expected to follow on from one another.
 - i) Semantic Network
 - ii) Script
 - iii) Frame
 - iv) CD
- f) Which of the following is not a type of data?
 - i) Ordinal
 - ii) Cardinal
 - iii) Nominal
 - iv) Categorical

P.T.O.

- g) _____ is the computational system that implements the control strategy and applies the rules.
- i) A set of rules
 - ii) A control strategy
 - iii) One or more knowledge
 - iv) A rule applier
- h) Which instruments are used for perceiving and acting upon the environment?
- i) Sensors and Actuators
 - ii) Sensors
 - iii) Perceiver
 - iv) Perceiver and sensor
- i) Which of the following statements correctly define knowledge representation in AI?
- i) It is the way in which facts and information are stored in the storage system of the agent.
 - ii) It is the way in which we feed the knowledge in machine understandable form.
 - iii) We modify the knowledge and convert it into the format which is acceptable by the machine
 - iv) All of the above
- j) Graph used to represent semantic network is _____ .
- i) Undirected graph
 - ii) Directed graph
 - iii) Directed Acyclic graph
 - iv) Directed complete graph

Q2) Answer any FOUR of the following. (Out of FIVE)

[4×2=8]

- a) Define the term-
 - i) Machine Learning
 - ii) Deep Learning
- b) State the things required to be considered when we want to build an AI system that is used to solve a particular problem.
- c) Write down the algorithm of Generate and Test.
- d) What is Resolution? Explain with Example.
- e) Which are components of script?

Q3) Answer any TWO of the following. (Out of THREE)

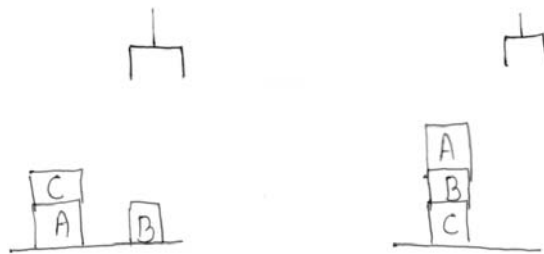
[2×4=8]

- a) Differentiate between supervised. Unsupervised and Reinforcement learning.
- b) Convert following statement in conceptual Dependency form.
 - i) Ramesh pushed the cart.
 - ii) Gita took the book from Sita.
- c) Write down the algorithm for conversion to clause form.

Q4) Attempt any TWO of the following. (Out of THREE)

[2×4=8]

- a) Explain Means End Analysis with an Example.
- b) Give state space representation for “Block Word Problem”. Initial and Goal State are shown in following figure.



Apply sequence of Actions & execution plan for acquiring goal state.

- c) Write down the script for watching Cricket.

Q5) Attempt any ONE of the following. (Out of TWO)

[1×3=3]

- a) Write down the algorithm for Breadth first search with its advantages.
- b) Represent the following statement into the appropriate semantic Network Diagram.

“Hema gave the green flowered vase to her cousin”.

* * *

Total No. of Questions : 5]

SEAT No. :

PD564

[Total No. of Pages : 2

[6471]-55

T.Y. B.C.A. (Science)

**BCA-355 - SEC - II : CLOUD COMPUTING
(2019 Pattern) (Semester - V)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All Questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw labelled diagrams wherever necessary.*

Q1) Attempt any EIGHT of the following :

[8×1=8]

- a) What is a public cloud?
- b) What is cloud computing?
- c) What is APEX?
- d) What is AMI?
- e) What is grid computing?
- f) What is resource pooling?
- g) Which is the first step of the iterative seven step model migration process?
- h) What is the use of devops in microsoft Azure?
- i) What is a multi-cloud environment?
- j) What is cloud security?

Q2) Attempt any four of the following :

[4×2=8]

- a) Explain account hijacking as a challenge to cloud security.
- b) When would multi-cloud be adopted by an enterprise?
- c) What is Amazon lightsail?
- d) Explain Nimbus open software environment.
- e) What is an Amazon EC2 instance and how does it work?

Q3) Attempt any two of the following :

[2×4=8]

- a) What are the benefits of cloud computing?
- b) What are the load balancing features offered by the google cloud?
- c) What is Microsoft Azure?

P.T.O.

Q4) Attempt any two of the following :

[2×4=8]

- a) What are the benefits of cloud migration?
- b) Explain public and private blockchain.
- c) Write a short note on SaaS cloud computing security architecture.

Q5) Attempt any one of the following :

[1×3=3]

- a) Which are the international cloud security frameworks?
- b) What are the components of slave node in Kubernetes?



Total No. of Questions : 4]

SEAT No. :

PD565

[6471]-61

[Total No. of Pages : 3

T.Y.B.C.A. (Science)

**BCA- 361-DSE-IV : ANDROID PROGRAMMING
(2019 Pattern) (Semester -VI)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) **Figures to the right indicate full marks.**
- 2) **Draw diagram wherever necessary.**

Q1) Attempt the following:

A) Choose the correct options.

[5 ×1=5]

- a) Android is primarily designed for _____.
 - i) Smartphones
 - ii) Computers
 - iii) TV
 - iv) All mentioned
- b) A Fragment can be used in ____ activities.
 - i) Single
 - ii) Multiple
 - iii) Both (i) & (ii)
 - iv) None
- c) Three ways to persist activity state use ____ methods.
 - i) onPause ()
 - ii) onSaveInstant
 - iii) onRetain
 - iv) All mentioned
- d) Android supports ____ types of menu.
 - i) Popup
 - ii) Primary
 - iii) Secondary
 - iv) Fragment
- e) ____ is an activity action which specifies that we are sending some data.
 - i) ACTION-RECEIVE
 - ii) ACTION-SEND
 - iii) ACTION-BROADCAST
 - iv) ACTION-RETAIN

P.T.O.

B) Answer the following [5 ×1=5]

- a) How to close database using SQLite?
- b) What is spinner?
- c) Example of Text View.
- d) What is Fragment?
- e) What is Marker?

Q2) Answer the following: (Any Five) [5×3=15]

- a) How to calling built in applications using intent? Describe with example.
- b) Define terms:
 - i) Button
 - ii) Text View
 - iii) Check box
 - iv) SMS
- c) With the help of example describe getting location data.
- d) Write an program to check number is armstrong or not.
- e) Explain the Auto Complete Text View in detail.
- f) Create an android application to send SMS using intent.
- g) Explain Architecture of Android.

Q3) Answer the following: (Any Five) [5×4=20]

- a) Explain SDK platform in detail.
- b) Write a short note on: Interaction between fragments?

- c) Describe the following:
 - i) Linear Layout
 - ii) Table Layout
- d) What is Toggle Button? How to create it?
- e) Write note on: Creating the helper method.
- f) With the help of diagram describe Android Architecture.
- g) Describe ADT in detail.

Q4) Answer the following: (Any Five)

[5×5=25]

- a) Write a note on : monitoring a location in Google Map.
- b) What is caveats & warnings? With the help of example explain it.
- c) How to changes to screen orientation?
- d) With the help of diagram Absolute Layout.
- e) Explain Life cycle of Fragment.
- f) What is intent? Types of Intent.
- g) What is cursor? Explain with example.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 3

PD566

[6471]-62

T.Y. B.C.A.

SCIENCE

**BCA-362, DSE-V : Programming in GO
(2019 Pattern) (Semester-VI)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw labeled diagram wherever necessary.*
- 3) *Figures to the right indicates full marks.*

Q1) Attempt the following.

[5×1=5]

A) Choose the correct options.

- a) Which of the following is the default value of a global variable in Go?
 - i) Undefined
 - ii) 0 or nil
 - iii) Not fixed
 - iv) -1
- b) To call a function user must _____ the required parameters along with its function name.
 - i) pass
 - ii) ignore
 - iii) return
 - iv) execute
- c) Anonymous functions can be defined _____ without the need for a name.
 - i) outline
 - ii) outside class
 - iii) inline
 - iv) offline
- d) A wait group provides a _____ synchronization mechanism in Go Lang.
 - i) Go routine
 - ii) Statement
 - iii) Identifier
 - iv) Variable
- e) _____ can give information about the performance of a function or a program.
 - i) Bench marking
 - ii) Go routine
 - iii) Variables
 - iv) Identifiers

P.T.O.

B) Attempt the following. [5×1=5]

- a) What is the purpose of Println?
- b) What do you mean by functions as value in Go?
- c) What are different types of arrays in Go language?
- d) Write the syntax of embedded interfaces.
- e) What is a Go routine?

Q2) Answer the following. (Any five) [5×3=15]

- a) How would you print the type of variable in Go?
- b) Explain the syntax to create a function in Go.
- c) Explain method of initializing slices using Multiline syntax.
- d) Differentiate between method and function.
- e) What is the purpose of the wait group?
- f) When does blank import of packages is used?

Q3) Answer the following. (Any five) [5×4=20]

- a) Explain the concept of methods with pointer receiver?
- b) What do you mean by Type Assertions and Type Switches?
- c) Explain how to append one or more elements to an existing array slice.
- d) What will be output of the following code?

```
package main
import "fmt"
func average(nums []float64)
    float64 {
    total := 0.0
    for _, V := range nums {
        total += V
    }
    return total/float64(len(nums))
}
func main() {
    scores := []float64 {1, 2, 3, 4}
    fmt.Println(average(scores))
}
```

- e) Explain the syntax of for loop with example.
- f) What are Timers and Ticklers?
- g) What are the benefits of multiple return values?

Q4) Answer the following. (Any five)

[5×5=25]

- a) Write a program in Go language to print fibonacci series of n terms.
- b) What will be the output of the following code?

```
package main  
import "fmt"  
const PI = 3.14  
func main () {  
    const CFG = " Love coding"  
    fmt.Println (" Hello", CFG)  
    fmt.Println ("Happy", PI, "Maths coding")  
    const correct = true  
    fmt.Println ("Go rules to be verified, correct")  
}
```

- c) Write a program in Go language to illustrate the concept of returning multiple values from a function.
- d) Write a program in Go language to accept two matrices and display its addition.
- e) Write a Go program to illustrate the method with struct type receiver.
- f) What do you mean by Buffered channel and Unbuffered channel?
- g) Write a program in Go language to add two integers and write code for unit tests to test this code.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

PD567

[6471]-63

T.Y. B.C.A.

SCIENCE

**BCA-363-DSE-VI : Software Project Management
(2019 Pattern) (Semester - VI)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw labeled diagram wherever necessary.*
- 3) Figures to the right indicates full marks.*

Q1) Attempt the following :

[5×1=5]

A) Choose the correct options :

- a) _____ of the following activity is not the part of project planning.
 - i) Project estimation
 - ii) Project scheduling
 - iii) Project monitoring
 - iv) Risk management
- b) _____ phases are there in scrum.
 - i) Four
 - ii) Three
 - iii) Two
 - iv) Five
- c) _____ task is part of software configuration management.
 - i) Audit control
 - ii) Change control
 - iii) Process control
 - iv) Management control
- d) _____ activity is under taken once the development activities start.
 - i) Project planning
 - ii) Project size estimation
 - iii) Project monitoring and control
 - iv) Project cost estimation
- e) Networks usually indicate activity precedence constructed from _____.
 - i) Left to Right
 - ii) Right to Left
 - iii) Bottom to Top
 - iv) Up to Bottom

B) Attempt the following :

[5×1=5]

- a) List out phases in scrum.
- b) Define backward pass method.
- c) Define precedence diagram method.
- d) What is dependency?
- e) What is communication plan?

P.T.O.

Q2) Answer the following (Any five)

[5×3=15]

- a) Describe CPN (Constructing Precedence Networks) with an example.
- b) Write note on PMBOK.
- c) Explain how to manage people? How to select staff?
- d) Compare agile and non-agile project.
- e) How to manage the contract in project management?
- f) Explain forward pass technique in details.

Q3) Answer the following. (Any five)

[5×4=20]

- a) Explain phases of project life cycle.
- b) Write a detailed note on build or buy decision.
- c) Explain project scheduling in agile environment.
- d) Explain software configuration management.
- e) What are the roles and responsibility of software development team?
- f) Describe CPM in detail with the help of diagram.
- g) What is Gantt chart? Explain with an example.

Q4) Answer the following. (Any five)

[5×5=25]

- a) What is Hackman model? Explain with an example.
- b) Explain roles and responsibility of an agile team.
- c) List and explain the different activity relationships in detail.
- d) Define WBS and explain its types with the help of diagram.
- e) Explain visualizing progress in detail with an example.
- f) Explain Network planning model and its types.
- g) Discuss organizational behaviour with an example.



Total No. of Questions : 5]

SEAT No. :

PD568

[Total No. of Pages : 2

**[6471]-64
T.Y.B.C.A.
SCIENCE**

**BCA-364, SEC - III : Management Information Systems
(2019 Pattern) (Semester - VI)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw labeled diagram wherever necessary.*

Q1) Attempt any Eight of the following.

[8×1=8]

- a) _____ is backbone of any organization.
 - i) Information
 - ii) employee
 - iii) management
 - iv) decision
- b) In which of the following method data is collected from recipient with the help of predesigned questions in individual conversation manner?
 - i) interviews
 - ii) records
 - iii) observation
 - iv) surveys
- c) Which of following is decision analysis models?
 - i) What no analysis
 - ii) Break analysis
 - iii) Loop analysis
 - iv) Goal seeking analysis
- d) BPR stands for _____.
 - i) Business process Re-engineering
 - ii) Business product Re-engineering
 - iii) Best process Re-engineering
 - iv) Best product Re-engineering
- e) What is the term for a radical rethinking of the nature of the business?
 - i) Transformational change
 - ii) Revolutionary change
 - iii) Strategic manoeuvre
 - iv) Paradigm shift
- f) ERP stands for
 - i) Enterprise Resource planning
 - ii) Enter Resource planning
 - iii) Enterening Repeat planning
 - iv) Enterprise Repeat planning

P.T.O.

- g) DMS stands for
- Document most system
 - Document management system
 - Do management system
 - Document method system
- h) _____ knowledge people hold in their minds.
- Tacit
 - Explicit
 - Informative
 - Most of the
- i) _____ is tertiary sector.
- Service
 - Enterprise
 - Management
 - Application
- j) KBES stands for
- Knowledge Based Expert Systems
 - Knowledge Bottom Expert Systems
 - Knowledge Based Excel Systems
 - Knowledge Bought Expert Systems

Q2) Attempt any Four of the following. [4×2=8]

- What do you mean by MIS? State its objectives.
- What are different types of tasks are involved in information management?
- What is an Enterprise management system? State various components of it.
- Draw a neat diagram of knowledge management system.
- What is financial MIS?

Q3) Answer any Two of the following. [2×4=8]

- Explain in brief any two methods of information collection.
- With neat diagram explain process of supply chain management.
- Explain different types of DSS.

Q4) Attempt any Two of the following. [2×4=8]

- Explain sensitivity analysis with the help of example.
- What are various applications of VSM?
- What do you mean by Requirement definition and description? state any two advantages of it.

Q5) Attempt any One of the following. [1×3=3]

- Explain various phases of BPR.
- Differentiate between Business Intelligence and Business Analytics.



Total No. of Questions : 5]

SEAT No. :

PD569

[Total No. of Pages : 2

[6471]-65

T.Y. B.C.A.

SCIENCE

**BCA-365-SEC-IV : Internet of Things
(2019 Pattern) (Semester - VI)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicates full marks.*
- 3) Draw labelled diagram wherever necessary.*

Q1) Attempt any eight of the following : (out of ten)

[8×1=8]

- a) _____ an embedded system communicate with the outside world.
 - i) Memory
 - ii) Output
 - iii) Peripherals
 - iv) Input
- b) _____ of the following offers external chips for memory and peripherals interface circuits.
 - i) Embedded system
 - ii) Peripheral system
 - iii) Microcontroller
 - iv) Microprocessor
- c) _____ one of the following offers CPUS as integrated memory or peripheral interfaces.
 - i) Memory system
 - ii) Embedded system
 - iii) Microcontroller
 - iv) Microprocessor
- d) _____ of the following is not IoT devices
 - i) Laptop
 - ii) Arduino
 - iii) Table
 - iv) Tablet
- e) _____ of the following is false about the IoT components?
 - i) A light sensor (photoresistor) is an analog sensor
 - ii) A microphone is a digital sensor
 - iii) A push button is a digital sensor
 - iv) A keyboard is a digital sensor
- f) _____ of the following is not a fundamental component of an IoT system?
 - i) Sensors
 - ii) Connectivity and data processing
 - iii) User interface
 - iv) Transformer
- g) _____ of the following is not an application of IoT.
 - i) BMP280
 - ii) Smart home
 - iii) Smart city
 - iv) Self-driven cars

P.T.O.

- h) _____ of the following is not on IoT platforms?
- i) Amazon web services ii) Microsoft Azure
 - iii) Sales force iv) Flipkart
- i) What is IoT?
- i) A network of physical objects embedded with sensors
 - ii) Network of virtual objects
 - iii) Network of objects in the ring structure
 - iv) Network of sensors
- j) Which of the following is an IoT device?
- i) Table ii) Laptop
 - iii) Mug iv) Desktop

Q2) Attempt any four of the following. (out of five) **[4×2=8]**

- a) What are the applications of IoT.
- b) Short note on sensor networks.
- c) Short note on SkyNet IoT.
- d) What is messaging platform.
- e) State and explain in short Access control.

Q3) Attempt any two of the following. (out of three) **[2×4=8]**

- a) Explain Zigbee Architecture in detail.
- b) What are the components of microcontroller.
- c) Explain security model for IoT in detail.

Q4) Attempt any two of the following. (out of three) **[2×4=8]**

- a) Explain cloud storage models.
- b) Differentiate between M2M and WSN protocols.
- c) What are the IP based protocols? Explain.

Q5) Attempt any one of the following. (out of two) **[1×3=3]**

- a) Explain any two key elements of IoT security.
- b) What are the IoT devices? Explain any two devices.

