(2½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All

(a) Multiple Choice Questions (10M)

i. Which requirements is the foundation from which quality is measured?
a) Hardware
b) Software
c) Programmers
d) None of the mentioned

ii. Which of the following is not a SQA plan for a project?
a) evaluations to be performed
b) amount of technical work
c) audits and reviews to be performed
d) documents to be produced by the SQA group

iii. Quality Management in software engineering is also known as
a) SQA
b) SQM
c) SQI
d) SQA and SQM

iv. A set of activities that ensure that software correctly implements a specific function.
a) verification
b) testing
c) implementation
d) validation

v. Who identifies, documents, and verifies that corrections have been made to the software?
a) Project manager
b) Project team
c) SQA group
d) All of the mentioned

vi. A testing conducted at the developer's site under validation testing.
a) alpha
b) gamma
c) lambda
d) unit

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vii. What do you call testing individual components?
a) system testing
b) unit testing
c) validation testing
d) black box testing

viii Which metrics are developed based on the size oriented metrics,
a) number of Functions
b) number of user inputs
c) number of lines of code
d) amount of memory usage.

ix. According to ISO 9001, inspection and testing comes under which management responsibility?
a) Process control
b) Document control
c) Control of nonconforming products
d) Servicing

x. Which of the following is not a core step of Six Sigma?
a) Define
b) Control
c) Measure
d) Analyse

(b) **Fill in the blanks (product, requirements , Linear Order,** defect, Static Testing, validation **)** **(5M)**

i. Verification is followed by _____
ii. Software is a process and ——————————.
iii. In Water fall model, the phases involved in the software development are organized in——————————.
iv. Goal of testing is to check if the system meets the_____
v. A flaw in a component or system can cause the component or system to fail to perform its required function is known as _____

Q. 2 **Attempt the following (Any THREE)** **(15M)**

(a) Discuss the process in the context of software quality
(b) What do you mean by spiral model? Explain it in detail.
(c) What is the difference between verification and validation?
(d) Differentiate errors, faults and failures.
(e) What are the Structure-based (white-box) testing techniques?
(f) Explain any five quality factors in brief.

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Q. 3 Attempt the following (Any THREE) (15M)

(a) List and explain the different types of system testing.
(b) Explain Unit Testing and characterized the unit testing.
(c) Elaborate the concept of integration testing in details.
(d) Discuss the issues in measuring the software size using LOC as metric.
(e) Compare size oriented and function oriented metrics.
(f) Explain the defect report template in brief.

Q. 4 Attempt the following (Any THREE) (15M)

(a) Discuss the formal technical review in detail
(b) Explain the cause and effect diagram in detail.
(c) Illustrate the concept run chart in detail with suitable example.
(d) What is Pareto diagram? Explain it in brief.
(e) Discuss different types of quality cost.
(f) Elaborate the concept of quality cost measurement.

Q. 5 Attempt the following (Any FIVE) (15M)

(a) Illustrate boundary value analysis with an example.
(b) Compare black box and white box testing.
(c) Describe walkthrough in detail.
(d) Explain the cyclomatic complexity measures in software metrics.
(e) Write short note on: Software Development Life Cycle.
(f) Discuss the importance of software metrics in brief.
(g) Explain the goals and objective of SQA
(h) Elaborate the concept of six sigma in brief.

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(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Graph Questions to be solved in answer sheet itself. No separate graph papers will be given.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt ANY FOUR from the following: (20M)

(a) Discuss the features of operation research approach in detail.

(b) Solve graphically following LPP to maximize profit
Max $Z = 40x_1 + 30x_2$
subject to $3x_1 + x_2 \leq 3000$
$x_1 \leq 8000$
$x_2 \leq 1200$
and $x_1, x_2 \geq 0$.

(c) Use simplex method to solve the following LPP
Max Z= $3x_1 + 7x_2$
Subject to the constraint,
$2x_1 + 5x_2 \leq 20$
$x_1 + 2x_2 \leq 4, \quad x_1, x_2 \geq 0$

(d) A company has two plants, each of which produces and supplies two products: A and B. The plants can each work up to 16 hours a day. In plant 1, it takes three hours to prepare and pack 1,000 gallons of A and one hour to prepare and pack one quintal of B. In plant 2, it takes two hours to prepare and pack 1,000 gallons of A and 1.5 hours to prepare and pack a quintal of B. In plant 1, it costs Rs 15,000 to prepare and pack 1,000 gallons of A and Rs 28,000 to prepare and pack a quintal of B, whereas in plant 2 these costs are Rs 18,000 and Rs 26,000, respectively. The company is obliged to produce daily at least 10 thousand gallons of A and 8 quintals of B.
Formulate this problem as an LP model to find out as to how the company should organize its production so that the required amounts of the two products be obtained at the minimum cost.

(e) Discuss the steps to solve two phase method.

(f) Explain the role of operations research in decision-making.

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Q. 2 Attempt ANY FOUR from the following: (20M)

(a) What is integer programming problem and explain different types of integer programming problems.

(b) Write the dual of the following LP problem
Minimize $Z_x = 3x_1 - 2x_2 + 4x_3$
subject to the constraints
(i) $3x_1 + 5x_2 + 4x_3 \geq 7$, (ii) $6x_1 + x_2 + 3x_3 \geq 4$, (iii) $7x_1 - 2x_2 - x_3 \leq 10$
(iv) $x_1 - 2x_2 + 5x_3 \geq 3$, (v) $4x_1 + 7x_2 - 2x_3 \geq 2$
and $x_1, x_2, x_3 \geq 0$

(c) Explain the rules in constructing dual from primal and hence, convert the following primal to dual
Max Z= $5x_1 + 6x_2 + 3x_3$
Subject to the constraint,
$2x_1 + 5x_2 + 6x_3 \geq 12$
$x_1 + 2x_2 + 4x_3 \geq 4, \quad x_1, x_2, x_3 \geq 0$

(d) Write the advantages of duality.

(e) Explain the steps involved in branch and bound method.

(f) Explain Principle of Complementary Slackness.

Q. 3 Attempt ANY FOUR from the following: (20M)

(a) Differentiate between Linear programming problem and Goal Programming

(b) An automobile dealer wishes to put four repairmen to four different jobs. The repairmen have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The dealer has estimated the number of man-hours that would be required for each job-man combination. This is given in matrix form in the following table:

	JOBS				
		A	B	C	D
	1	5	3	2	8
MEN	2	7	9	2	6
	3	6	4	5	7
	4	5	7	7	8

Find the optimal assignment that will result in minimum manhours needed

(c) Explain Hungarian method to solve assignment problem

(d) Determine an initial basic feasible solution to the following transportation problem by using (a) the least cost method, and (b) Vogel's approximation method.

	D1	D2	D3	D4	Supply
S1	1	2	1	4	30
S2	3	3	2	1	30
S3	4	2	5	9	40
Demand	20	40	30	10	

(e) Write the transportation Algorithm to find the initial basic feasible solution.

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(f) A company has 4 machines on which 3 jobs are to be executed. Each job can be assigned to one and only one machine. The cost matrix is given below obtain the multiple optimal solution to the problem.

		Machines		
Jobs	P	Q	R	S
A	18	24	28	32
B	8	13	17	19
C	10	15	19	22

Q. 4 Attempt <u>ANY FIVE</u> from the following: **(15M)**

(a) Discuss about the computer software in operation research.

(b) Write the economic interpretation of dual constraints and dual variables.

(c) What is Assignment problem and give two applications.

(d) Explain the use of slack, surplus and artificial variables in simplex method and explain what is redundant constraint in graphical solution.

(e) What do you understand by the term 'sensitivity analysis?

(f) A company has three production facilities *S*1, *S*2 and *S*3 with production capacity of 7, 9 and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses *D*1, *D*2, *D*3 and *D*4 with requirement of 5, 8, 7 and 14 units (in 100s) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below. Use Least Cost Method (LCM) to find initial basic feasible solution to the transportation problem

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

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(2½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All

(a) Multiple Choice Questions **(10M)**

i) Single-mode shell runs as
a)admin user b) log user
c) root user d) single user

ii) If a file has permissions that appear as rwxr-x---, what is the octal Permission mode of the file?
a) 760 b)740
c)750 d) 650

iii) The sudo command stands for -------
a) Su b) Superuser does
c)Superuser do d) super do

iv) What does TLS stands for
a)Total layer security b)Transport LAN Security
c)Transport List Stand d) Transport Layer Security

v) What is the name of sambha server identified by the Windows Computer?
a)Samba name b)net-name-bios
c)net.bio.sambaname d)netbios name

vi) Which DataBase is responsible for configuration of the database in Apache ?
a) DBMS b) MYSQL
c)RDBMS d) DBA

vii) Which command is used to apply permission of read,write and execute?
a) R-W-E b) chmod
c) chmod –f c) RWE

viii) What does the UDP stands for?
a)User Device Print b) User Delay Password
c)User Diagram Process d) User Datagram Protocol

ix) What does the ICMP stand for?
a) Internet Control Message Privacy b)Internet Control Message Public
c)Intranet Control Message Protocol d)Internet Control Message Protocol

x) What types of protocols are used in VPNs?
a) Application level protocols b)Tunnelling protocols
c) Network protocols d) Mailing protocols

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(b) **Fill in the blanks** **(5M)**
(www,scp,rsa,ftpserver,groupadd,DynamicIPaddress,groupmod,MACaddress,ssh,org.,openSSH)

i) The groups can be created with the---------- command.
ii) The ---------- is a collection of tools using a secure protocol for communication with remote Linux computer
iii) DHCP provides _____ to the client
iv) The vsftpd package is used for the _____software
v) In website 'www.support.example.org.' _____is top level domain

Q. 2 Attempt the following (Any THREE) **(15M)**

(a) Explain init in regards with the following points:
i) Init process and run levels.
ii) RC scripts.
(b) Explain the user management commands in linux in detail.
(c) Explain the following files in detail:
i) /etc/passwd ii) /etc/shadow
(d) Explain ARP protocol in detail.
(e) What is Netfilter? Explain steps to install and configure Netfilter.
(f) Explain ext3 and ext4 file system in linux in detail.

Q. 3 Attempt the following (Any THREE) **(15M)**

(a) Describethe Apache. Write its benefits.
(b) Differentiate between IMAP and POP3 protocol.
(c) What is DNS Server? Explain how it works.
(d) Write a short note on SMTP
(e) Write a short note on Kerberos
(f) Explain how to disable anonymous FTP.

Q. 4 Attempt the following (Any THREE) **(15M)**

(a) Explain how to install and configure NFS server and client.
(b) What is DHCP? Explain working of DHCP.
(c) What is NIS? Discuss NIS daemons and processes.
(d) Discuss smbclient program.
(e) Define MySQL. Explain steps to install MySQL
(f) Write different Distributed File System (DFS) implementations.

Q. 5 Attempt the following (Any FIVE) **(15M)**

(a) Define the following terms regarding volume management.
i) Physical Volume
ii) Logical Volume
iii) Volume Group
(b) Explain rpm tool.
(c) Discuss the 3 Email components
(d) How user management helps to secure Linux server from security threats?
(e) What is SSH Client? Explain their vendors.
(f) What are the different OpenLDAP utilities are available?
(g) Write a short note on Jabber.
(h) Explain grub.conf file with its parameters

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(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt ANY FOUR from the following: (20M)

(a) Explain how dot product is used in calculation of back face detection.
(b) Discuss the concept of 2D scaling with examples.
(c) Describe the role and significance of color in the context of 3D modelling and rendering.
(d) Given a homogeneous point (1, 2, 3). Apply rotation 90 degree towards X, Y and Z axis and find out the new coordinate points.
(e) Explain types of parallel projections.
(f) Write a short note on Shader Models.

Q. 2 Attempt ANY FOUR from the following: (20M)

(a) Explain 2D and 3D game development with NumPy.
(b) Describe the concept of IDE.
(c) Explain about feature levels in Direct3D.
(d) Discuss the game engine architecture.
(e) Describe the process of animating a game object in Pygame, providing detailed steps and explanations for implementing animation with Pygame's game object.
(f) Write a short note on multisampling theory.

Q. 3 Attempt ANY FOUR from the following: (20M)

(a) Which are the game design strategies, explain.
(b) How to use sprites in Unity, explain.
(c) Describe the steps necessary to script collision events.
(d) Write a note on Unity Colliders.
(e) Explain various animation types and components used in Unity.
(f) Briefly discuss Unity's virtual world.

Q. 4 Attempt ANY FIVE from the following: (15M)

(a) How to calculate the surface area of parallelogram using vectors r and s?
(b) Which are the main components of game engine?
(c) Describe the primary functions used by Unity's game loop.
(d) Describe any three types of light used in models.
(e) Write any three key features of 2D Pygame.
(f) Explain loops are supported by Unity.

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(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt ANY FOUR from the following: (20M)

(a) Explain the concept of understanding computer forensics?
(b) Explain computer investigation in detail?
(c) Differentiate between public sector and Private sector investigations?
(d) Explain the necessary requirements for data recovery workstations and software?
(e) Write short note on Contingency Planning for Image acquisition?
(f) How will you analyse memory dump of a running computer system using FTK tool?

Q. 2 Attempt ANY FOUR from the following: (20M)

(a) Explain 5 computer forensics tools?
(b) Explain the necessary guidelines of seizing digital evidence at the scene?
(c) Describe how to collect evidence at private sector from incident scenes?
(d) Write a short note on recovering graphics files?
(e) Briefly explain copyright with graphics?
(f) How to detect hidden information or files within digital images using steganhide steganography tool and examine hidden content?

Q. 3 Attempt ANY FOUR from the following: (20M)

(a) Write short note on the network forensic?
(b) What is the general procedure for given live acquisition?
(c) Write a note on SIM card?
(d) Explain email header analysis?
(e) Explain the guidelines for report writing?
(f) How will you use the wireshark tool for identifying the live network ,capture packets, analyse capture packets?

Q.4 Attempt ANY FIVE from the following: (15M)

(a) Explain in detail advance forensic format?
(b) Explain short note on bitstream copies
(c) Explain types of data acquisition in detail?
(d) Explain the importance of investigation report?
(e) Explain acquisition procedures for mobile devices?
(f) Explain the digital networks for mobile phones?

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(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt all. (Each of 5 marks)

(A) Choose the correct alternative. **(10)**

(i) Which one of the following tranformation changes the size of the Object?
(a) Scaling
(b) Revolution
(c) Shearing
(d) Reflection

(ii) Pitch is angle of rotation about the _____axis
(a) x
(b) y
(c) z
(d) None

(iii) Sum of complementary angles is
(a) 90 degree
(b) 180 degree
(c) 0 degree
(d) 270 degree

(iv) The animation window in which animation is registered is called as _____
(a) Select mode
(b) Scene mode
(c) Record mode
(d) Edit mode

(v) Detecting hitting of game objects against each other is achieved using _____
(a) Rigid body
(b) Box colliders
(c) Gravity
(d) Transform

(vi) The Inspector Window shows the game object's _____
(a) Functions
(b) Property
(c) Benefits
(d) Defects

(vii) The _____ law helps to obtain intensity of light
(a) Law of physics
(b) Euler's
(c) Lambert's
(d) Langranges's

(viii) _____is the technology that allows directX to be programming language independent and have backward compatibility.
(a) DirectX
(b) COM
(c) Depth buffering
(d) Rendering

(ix) VR stands for_____
(a) Vendor Reality
(b) Virtual reality
(c) Vector Reality
(d) Video Reality

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(x) Configured game objects are called _____
(a) Asset
(b) Factory
(c) Prefab
(d) Icon

(B) Fill in the blanks. **(5)**

{Debug.log(), Linear, dot(.), Mask,Quadratic,determinant,modulus}

(i) The symbol used to represent scalar multiplication is _____
(ii) The notation ||r|| indicates _____of Vector r
(iii) Y=mx+c represents _____ Function.
(iv) The method used to send message to Unity console is _____.
(v) The UI control not visible on screen is _____

Q.2 Attempt the following:(ANY THREE) **(15)**

(a) Describe in detail the idea of perspective projection of objects.
(b) What is the procedure to derieve a unit normal vector for a triangle.
(c) Explain in detail scaling and translation in 3D.
(d) Describe the Vector Product of Vectors with adequate example.
(e) Explain the principles of direction Cosine .
(f) Write a short note on Gimball Lock

Q.3 Attempt the following:(ANY THREE) **(15)**

(a) What are the advantages and applications of B-Spline curve
(b) Describe the procedure to apply mesh on objects.
(c) What is meant by Depth Buffering ?Explain.
(d) Mention any three difference between Multisampling and Supersampling
(e) What are the activities in the Tesslation stage in DirectX
(f) How does the Input Assembler stage store vertices for polygon in memory?

Q. 4 Attempt the following:(ANY THREE) **(15)**

(a) Explain with example the FixedUpdate() method in Unity
(b) Explain any one VR device in detail
(c) Explain how to create and use scripts in Unity
(d) What are the benefits of Time.DeltaTime property in Unity
(e) Describe the Hierarchy of execution of Event functions in Unity
(f) How to publish a project in unity?Explain

Q. 5 Attempt the following:(ANY FIVE) **(15)**

(a) Illustrate 2D Rotation about an Arbitrary Point in detail.
(b) Describe the functionality of GPU
(c) Explain the method XMMatrixPerspectiveFovLH() used for projection in directX.
(d) What is the purpose of addForce() method in Unity script.
(e) Explain the various fields in which MR technology is applied
(f) Describe the idea of Texture in DirectX.
(e) What are raycasters? Explain in brief.
(f) What is an Animation clip and how it is created?

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(2½ Hours) **[Total Marks: 75]**

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt ANY FOUR from the following: **(20M)**

(a) Explain cron program in detail.
(b) Define the following terms regarding volume management.
  i) Physical Volume
  ii) Logical Volume
  iii) Volume Group
(c) Explain the following files in detail.
  i) /etc/passwd ii) /etc/shadow
(d) Describe Init in regards with the following points:
  i) Init process and run levels. ii) RC scripts.
(e) Explain grub.conf file with its parameters
(f) Write a short note on chains in iptables.

Q. 2 Attempt ANY FOUR from the following: **(20M)**

(a) What are the different DNS record types?
(b) Describe the Apache. Write its benefits.
(c) Write the steps to download configure and install openssh from source.
(d) Write a short note on ftp.
(e) Differentiate between IMAP and POP3 protocol.
(f) Write a short **note** on Kerberos.

Q. 3 Attempt ANY FOUR from the following: **(20M)**

(a) Explain how to install and configure dhcp server
(b) Explain steps to configure Samba server.
(c) Write different Distributed File System (DFS) implementations.
(d) Describe various OpenLDAP Utilities.
(e) Explain the following command with options and example.
  i) mount ii) showmount
(f) Define MySql. Explain steps involved in installing and configuring mysql server.

Q. 4 Attempt ANY FIVE from the following: **(15M)**

(a) Explain managing software using rpm
(b) Explain steps to install and configure sendmail server.
(c) Write a short note on Jabber.
(d) What is the importance of /etc/fstab in linux file system
(e) Describe IPv4 header format with diagram.
(f) What is NIS? Explain steps to configure primary NIS server.

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(2 ½ Hours) **[Total Marks: 75]**

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All

(a) Multiple Choice Questions. **(10M)**

1) UDDI stands for _____.
   a) Universal Description, Discovery, and Integration.
   b) Uniform Description, Discovery, and Integration.
   c) Universal Description, Discovery, and Interference.
   d) Unique Description, Discovery, and Integration.

2) What is the correct syntax of the declaration which defines the XML version?
   a) <xml version="A.0" /> b) <?xml version="A.0"?>
   c) <?xml version="A.0" /> d) <xml version="0" *>

3) In contrast, the contract-first approach encourages you to think of the service contract first in terms of_____.
   a) XML b) XML Schema(.xsd)
   c) WSDL d) All of the mentioned

4) The SOAP has _____ format to communicate.
   a) Document b) File
   c) Message d) Process

5) The default connection type used by HTTP is_____
   a) Persistent b) Non-Persistent
   c)Either a or b d) None of these

6) Which of the following HTTP Status code means NOT MODIFIED, used to reduce network bandwidth usage in case of conditional GET requests?
   a) 200 b) 201
   c) 204 d) 304

7) JAX-RS stands for _____
   a) JAVA for RESTful Web Services.
   b) JAVA API for RESTful Web Services.
   c) JAVA for ResultSet Web Services.
   d) JAVA for RESTful Web System.

8) WCF supports Operation overloading by setting following operation contract

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attribute?

a) Action b) Name
c) Overload d) None of the above

9) WCF attribute used to serialize Data Contract member variables?
a) Serialize b) Data Member
c)Data d) Methods

10) Which one is not a class in WCF?
a) BasicHttpBinding
b) BasicHttpContextBinding
c) BasicHttpsBinding
d) ClientBinding

(b) Fill in the blanks (**HTTP, Name, Service Transport, Stub, Service Protocol, TCP/IP, Code on Demand, ServiceContract, DataContract)** **(5M)**

1) RPC provides a _____ on the client side, a separate one for each remote procedure.
2) _____ layer is responsible for actually transporting XML messages between two computers.
3) _____ protocol is used in RESTful web Service.
4) _____ is REST Architectural Constraints.
5) _____ attribute is used to define a WCF service.

Q. 2 Attempt the following (Any THREE) **(15M)**

(a) What is web service. What are the features of web services?
(b) Write short note on SOAP web Service.
(c) What is the use of WSDL? Write its characteristics?
(d) Explain the Client Server Model with respect to Web Service.
(e) What is JAX-WS? How it is useful for describing SOAP web services?
(f) Write a short note on XML schema

Q. 3 Attempt the following (Any THREE) **(15M)**

(a) Describe the core constraints of RESTful system.
(b) Explain annotations used in RESTful web service.
(c) Write a short note on Swagger with respect to JAX-RS.
(d) Explain OAuth 2.0 with an example.
(e) List and explain the various HTTP methods required for creating RESTful Web Services.
(f) Write a short note of JSON object and JSON array.

Q. 4 Attempt the following (Any THREE) **(15)**

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(a) Explain the Features of WCF in detail.
(b) Explain concepts and terms used in the WCF documentation?
(c) Write a note on WCF Architecture.
(d) Explain various hosting options available for WCF Web Services.
(e) What do you mean by Operation Contract? Explain in detail.
(f) What is Service Contract? Explain with suitable example.

Q. 5 Attempt the following (Any FIVE) **(15)**

(a) Differentiate between Tight coupling and Loose Coupling in Web Service.
(b) Explain the structure of XML document with atleast one example.
(c) What is Marshalling and Unmarshalling in Inter Process Communication.
(d) Discuss goals of JAX-RS API.
(e) Discuss data types of JSON
(f) List the advantages and disadvantages of Statelessness.
(g) What are WCF's ABC?
(h) Write about Endpoint in WCF.

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(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt ANY FOUR from the following: **(20M)**

(a) Discuss OSI Security model architecture highlighting the attacks, mechanisms and services.
(b) Differentiate between active and passive attacks.
(c) Encrypt the following using play fair cipher using the keyword MONARCHY. " SWARAJ IS MY BIRTH RIGHT". Use X as filler character.
(d) Explain in detail the transformations take place in AES encryption procedure.
(e) Describe the working principle of DES with a neat diagram.
(f) Perform encryption and decryption using RSA Algorithm for the following. P=7; q=11; e=17; M=8

Q. 2 Attempt ANY FOUR from the following: **(20M)**

(a) Discuss how Diffie Hellman key exchange algorithm is a practical method for public exchange of a secret key?
(b) What is Message Authentication code? Explain its functions and basic uses.
(c) Explain key management and distribution in detail.
(d) What is the purpose of digital signature? Explain its properties and requirements.
(e) Explain how authentication is performed in Kerberos.
(f) What is Public Key certificate? Explain its usage with X.509 certificates.

Q. 3 Attempt ANY FOUR from the following: **(20M)**

(a) Explain how email messages are protected using S/MIME signing and encryption?
(b) With a neat sketch explain the IPSec scenario and IPSec Services.
(c) Explain different Web security requirements.
(d) Discuss Intrusion detection in detail.
(e) Give the taxonomy of malicious programs. Define each one.
(f) What is a firewall? What is the need for firewalls? What is the role of firewalls in protecting networks?

Q. 4 Attempt ANY FIVE from the following: **(15M)**

(a) Compare stream cipher with block cipher with example.
(b) Differentiate MAC and Hash function.
(c) Why is asymmetric cryptography bad for huge data? Specify the reason.
(d) What is dual signature? What is its purpose?
(e) Define the role of different SSL protocols.
(f) What is meant by SET? What are its features?

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(2 ½ Hours) [Total Marks: 75]

N.**B.** **1) All questions are compulsory.**
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt ANY FOUR from the following: **(20M)**

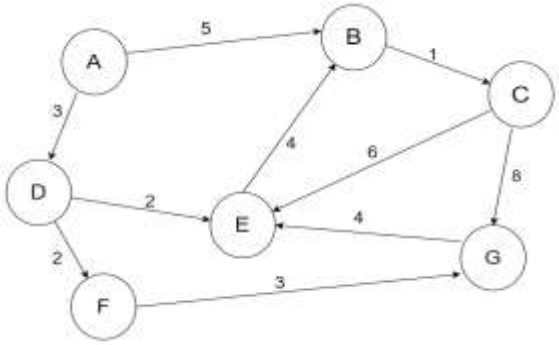
(a) Define AI. State any four applications of AI.

(b) What is PEAS? Mention it for Automated Taxi Driver and Soccer Playing Robot.

(c) Describe a Simple reflex Agent in detail.

(d) Explain following task environments with example.
i. Episodic vs. Sequential
ii. Deterministic vs. Stochastic

(e) Consider the following graph. Let the starting node be A and the goal node be G.



Find the Path Cost using Uniform Cost Search Algorithm.

(f) Explain A* search Algorithm. Also explain conditions of optimality of A*

Q. 2 Attempt ANY FOUR from the following: **(20M)**

(a) Write a short note on the AI Knowledge cycle.

(b) Explain Backpropagation Neural Network.

(c) Write a note on K-Nearest Neighbours.

(d) Explain any 5 membership functions of Fuzzy Logic Systems.

(e) What is Classification in Machine learning? Explain it with one example.

(f) Explain the concept of Regularization.

Q. 3 Attempt ANY FOUR from the following: **(20M)**

(a) Write a short note on the Hidden Markov Model.

(b) Explain Q- Learning in detail.

(c) What is Association rule mining?

(d) Explain Bayesian Learning with an example.

(e) Define Reinforcement Learning. Explain the various terms used in it.

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(f) Explain the use of following Metrics used to evaluate the strength of Association Rule Mining with one example.
   i) Support
   ii) Confidence
   iii) Lift

Q. 4 Attempt ANY FIVE from the following: (15M)

(a) Explain Acting Rationally approach of AI.

(b) What are the essential Properties of Searching Algorithms?

(c) Differentiate between Inductive and Deductive Reasoning.

(d) Write a note on following
   i) Entropy
   ii) Information Gain

(e) What are hidden variables? Give example.

(f) Write a note on Unsupervised Learning

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(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All

(a) **Choose the correct alternative from the options given** **(10M)**

(i) _____ is the ability to limit and control the access to host systems and applications via communications links.

a. Confidentiality b. Access Control
c. Integrity d. Authentication

(ii) Number of phases in the handshaking protocol of SSL?

a. one b. two
c. three d. four

(iii) _____ consists of measures to determine, prevent, detect, and correct security violations that involve the transmission of information.

a. Database Security b. Physical security
c. Network and internet security d. Cyber security

(iv) In AES stages, A substitution that makes use of arithmetic over GF (2^8) is called ____.

a. Substitute bytes b. Shift Rows
c. Mix Columns d. Add Round Key

(v) Hash-based message authentication code (HMAC) provides the server and the client each with a _____that is known only to that specific server and that specific client.

a. private key b. user key
c. manual key d. public-key

(vi) _____ block cipher mode of operation is applied for Secure transmission of single value.

a. CTR b. CBC
c. ECB d. CFB

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(vii) _____ are difficult to identify as they keep on changing their type and signature.
a. Non-resident virus
b. Boot Sector Virus
c. Polymorphic Virus
d. Multipartite Virus

(viii) _____ are used as the base of the Public Key Infrastructure.
a. SSL certificates
b. TLS certificates
c. HAS certificates
d. X.509 certificates

(ix) PGP is abbreviated as _____.
a. Pretty Good Privacy
b. Powerful Good Privacy
c. Protocol Giving Privacy
d. Pretty Good Protocol

(x) A honey pot is an example of what type of software?
a. Intrusion-detection
b. Encryption
c. Security policy
d. Virus

(b) **Fill in the blanks by selecting the correct option from the pool of options:** **(5M)**
(Tunnel, 6, Trojan Horse, RSA, Transport, 10, Network, Spyware, SSA, 8)

(i) IPSec is designed to provide security at the _____ layer.

(ii) In the _____ mode, IPSec protects information delivered from the transport layer to the network layer.

(iii) _____ is a general term for malicious software that pretends to be harmless so that a user willingly allows it to be downloaded onto the computer

(iv) _____ is a public key cryptography algorithm.

(v) AES has _____ number of rounds.

Q. 2 Attempt the following (Any THREE) **(15M)**

(a) Discuss the Principles of security.
(b) Explain Playfair Cipher, encrypt the plain text "SECRET MESSAGE" by using keyword "PROBLEM".
(c) List and briefly define categories of security services.
(d) Explain the following algorithm modes :
i. ECB
ii. CBC
(e) Using RSA algorithm, what is the value of cipher text C, if the plain text M=5 and p=3, q=11 and d=7?
(f) What are transposition techniques? Explain any one with the help of an example.

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Q. 3 Attempt the following (Any THREE) (15M)

(a) Explain the working of the SHA algorithm.
(b) What is digital signature? List the requirements of Digital signatures.
(c) Write a note on HMAC.
(d) Give a brief overview of Kerberos.
(e) Discuss the format of X.509 Certificate.
(f) What are the Problems with public key exchange and explain man in middle attack with example.

Q. 4 Attempt the following (Any THREE) (15)

(a) Explain the format of ESP Header in IPSec.
(b) Write a short note on Honeypots.
(c) Explain the working of the SSL Handshake Protocol.
(d) What is a Firewall? Enlist its characteristics
(e) Explain Intrusion Techniques in detail.
(f) Discuss various virus Countermeasures.

Q. 5 Attempt the following (Any FIVE) (15)

(a) Define:
i. Confidentiality
ii. Integrity
iii. Availability
(b) List the differences between Kerberos Version 4 and 5.
(c) Explain the concept of a Hash Function.
(d) What are the components of simple symmetric cipher model?
(e) List the advantages of IPSec.
(f) Differentiate between TLS and SSL
(g) Discuss Mono Alphabetic Cipher with the help of an example.
(h) Explain the different types of intruders.

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