(3hours) **Total Marks: 80**

N.B: **(1) Question No. 1 is compulsory.**
(2) Attempt any three questions out of remaining five questions.
(3) Make suitable assumptions wherever necessary.

Q.1. a) Differentiate between System software & Application software. [05]

b) What is Left recursion? Check if the following grammar is left recursive, and take necessary action if it exists: [05]

$$S \rightarrow SS+ \mid SS* \mid a$$

c) Discuss the forward reference problem in assembler with suitable example. [05]

d) Explain different functions of loader in detail. [05]

Q.2. a) Explain any five code optimization in compiler designing with suitable example. [10]

b) Explain with the help of flow chart the working of two pass assembler along with databases used. [10]

Q.3. a) Explain Design of Direct Linking Loader. [10]

b) Construct LL(1) parsing table for the following grammar: [10]

$S \rightarrow aBDh$
$B \rightarrow cC$
$C \rightarrow bC \mid \varepsilon$
$D \rightarrow EF$
$E \rightarrow g \mid \varepsilon$
$F \rightarrow f \mid \varepsilon$

Q.4. a) Generate 3-address code for the following C program and construct flow graph with the help of basic blocks : (assume 4 memory locations for integer): [10]

```
min=a[0];
for (i=1;i<n;i++)
  if(a[i]>max)
     max=a[i];
flag=1;
```

b) With reference to MACRO, explain the following tables with suitable example: [10]
i) MNT ii) MDT iii) ALA

Q.5. a) Explain design issues in code generation in detail. [10]

b) Explain Phases of compiler with following example [10]

$$a = a * b - 5 * 3 / c$$

Q.6. Write short note on: [20]
a) Three address code representation
b) YACC
c) Parameterized Macros
d) Syntax directed translation

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Duration: 3Hours **[Max Marks : 80]**

N.B : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR **[20]**

a Explain Euclidean Algorithm.

b Explain RC4 stream cipher.

c Differentiate between SHA-1 and MD5

d Explain worms and viruses

e Discuss RSA as a digital signature algorithm.

2 a Explain Diffie Hellman key agreement algorithm. Also discuss the possible attacks on it. Consider the example where A and B decide to use the Diffie Hellman algorithm to share a key. They choose p=23 and g=5 as the public parameters. Their secret keys are 6 and 15 respectively. Compute the secret key that they share **[10]**

b Explain Advanced Encrypted Standards (AES) in detail. **[10]**

3 a Explain cryptographic hash functions with properties of secure hash function. **[10]**

b What is ICMP flood attack? Explain in detail. **[10]**

4 a Explain Public Key Distribution in detail. **[10]**

b Encrypt the string "The Key is hidden under the door" with Play fair cipher using the keyword "domestic". **[10]**

5 a What are the different components of IDS? List and explain different approaches of IDS. **[10]**

b Explain Needham-schroeder authentication protocol. **[10]**

6 a Write a short note on **[10]**
1. Packet Sniffing.
2. ARP spoofing.

b Discuss various attacks on Digital signatures. **[10]**

Duration: 3hrs **[Max Marks: 80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.

Q1. Attempt any FOUR Questions 20

a) Explain the concept of frequency reuse with clustering.
b) Compare LTE and LTE advanced.
c) What is Hidden and Exposed station problem?
d) What are the roles of EIR and HLR entities in a GSM network?
e) Discuss about the mobile services and data services in GSM.

Q2 a) What do you mean by Self Organizing Networks. Explain the architecture of SON. 10

Q2 b) What is a need of Micro Mobility? Explain Cellular IP in detail. 10

Q3 a) What are the different Handover mechanism in GSM? Explain each handover mechanism in brief. 10

Q3 b) Explain the protocol architecture of IEEE 802.11 with diagram. 10

Q4 a) Explain the GPRS architecture, explain each block in detail. 10

Q4 b) Explain snooping TCP and mobile TCP with their merits and demerits. 10

Q5 a) What is spread spectrum? Why is it used? Explain any one of the spread spectrum techniques. 10

Q5 b) Explain Mobile Terminated Call and Mobile Originated Call. 10

Q6 a) Explain the mechanism for IP packet delivery using mobile IP. 10

Q6 b) Discuss in detail about Wi-Fi security protocol. 10

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(3 Hours) **[Total Marks: 80]**

Note: i) Question no. 1 is compulsory
ii) Attempt any three from remaining
iii) Assume necessary data

1	(a)	Explain the Learning Agent with suitable block diagram.	**5**
	(b)	Give difference between Informed Search and Uninformed search Algorithms.	**5**
	(c)	Give PEAS and state space description for "Automobile Driver Agent"	**5**
	(d)	Explain different quantifiers with example.	**5**
2	(a)	Explain various properties of task environment with suitable examples	**10**
	(b)	What is Game Playing Algorithm? Draw a game tree for Tic-Tac-Toe problem.	**10**
3	(a)	Illustrate forward-chaining and backward-chaining algorithm with suitable example.	**10**
	(b)	Explain Hill Climbing Algorithm and problems that occurs in hill climbing algorithm?	**10**
4	(a)	What do you mean by Resolution? Also discuss the steps in Resolution.	**10**
	(b)	Consider problem of changing a flat tire. The goal is to have a good spare tire properly mounted on to the car's axle, where the initial state has a flat tire on the axle and a good spare tire in the trunk. Give the ADL description for the problem and also discuss the solution	**10**
5	(a)	Explain Partial-order planning with suitable example.	**10**
	(b)	Define Belief Network. Describe the steps of constructing belief network with an example.	**10**
6		Write short notes on **any Two** of following:	
	(a)	Explain different applications of AI in Healthcare, Retail and Banking.	**10**
	(b)	Alpha Beta Pruning	**10**
	(c)	Wumpus world Environment	**10**

(3 Hours) **Total Marks 80**

NB :
1) Question **number 1** is compulsory
2) Attempt **any three** out of the remaining **five questions**.
3) Assume suitable data if **necessary** and justify the assumptions.
4) Figures to the **right** indicate full marks

Q1 Answer the Following **20**

a) The following is the distribution of total household expenditure (in RS) of 202 workers in a city.

Expenditure (in RS)	Number of workers	Expenditure (in RS)	Number of workers
100-150	25	300-350	30
150-200	40	350-400	22
200-250	33	400-450	16
250-300	28	450-500	8

Draw a suitable diagram to comment on distribution of data.

b) Difference between Probability sampling and non-Probability sampling

c) Explain the following methods to check the performance of regression Model.
   i) MAE
   ii) MAPE

d) Explain MP and UMP test.

Q2 a) Out of a total number of 10,000 candidates who applied for jobs in government department, 6,854 were males, 3,146 were graduates and others, non graduates. The number of candidates with some experience was 2,623 whom 1,860 were males. The number of males graduate was 2,012. The number of graduates with experience was 1093 that includes 323 females. **10**

b) What are the different methods of collection of data? Why are personal interviews usually preferred to questionnaire? Under what conditions may a questionnaire prove as personal interview? **10**

Q3 a) From the following Data **10**

X	40	34	28	30	44	38	31
Y	32	39	26	30	38	34	28

Find: 1. Coefficient of Regression
2. lines of Regression
3.Coefficient of correlation

b) Explain order of coefficient regression. In a certain trivariate distribution, $r_{12} = 0.7$, $r_{23} = r_{13} = 0.6$ find all the partial correlation coefficient. **10**

Q4 a) The following data are given regarding expenditure on advertising and sales of a particular firm : **10**

	Advertising expenditure X	Sales(in Lakhs) Y
Mean	10	90
Standard Deviatiation	3	12

Correlation coefficient r=0.8

i) Calculate the regression equation of Y on X.

ii) Estimate the advertisement expenditure required to attain a sales target of 120 lakhs.

b) For the given data **10**

i) Fit a regression $\hat{y} = a + b1x1 + b2x2$

ii) Find the coefficient of multiple determination (R^2).

iii) Also test the significance of regression (Given the appropriate Table value, F = 13.274, for a significance level of $\alpha = 0.01$)

Y	x1	x2
150	65	24
155	62	25
159	67	24
179	70	20
192	71	15
200	72	14
212	75	14
221	76	12

Q5 a) The mean lifetime of a sample of 400 fluorescent light tube produced by a company is found to be 1570 hours with a standard deviation of 150 hours. Test of hypothesis that the mean lifetime of the bulb produced by the company is 1600 hours at 1% level of significance. (From table 1% level of significance =2.33) **10**

b) What is Hypothesis testing? Explain **10**

i) Z-test for single Mean

ii) Z-test for difference of mean

Q6 Answer the following **20**

a) Explain Point Estimation with characteristics.

b) Explain Type I and Type II error in detail.

Time: 3 Hours **Max. Marks: 80**

Instructions:

1) Attempt **any Four question out of six** questions.
2) All question carries equal marks.
3) Illustrate your answers with neat sketches wherever necessary.
4) Figures to the right indicate full marks.
5) Assume suitable additional data, if necessary and clearly state it.
6) All sub-questions of the same question should be grouped together.

Q.1	**(a)**	What is IoT? Compare with suitable criterion between Operational Technology (OT) and Information Technology (IT).	**10**
	(b)	With suitable examples, explain the types of sensors used in IoT systems.	**10**
Q.2	**(a)**	Explain the Smart Things: architectural classification considering Layer 1 Things-Sensors and Actuators Layer.	**10**
	(b)	Give the Categories of IoT application protocols and their transport methods. Describe the factors should be considered when selecting a transport layer for an IoT application layer protocol.	**10**
Q.3	**(a)**	Discuss the application of IoT in Cities.	**10**
	(b)	Compare with suitable factors Microsoft Azure IoT and Google Cloud IoT used as IoT Software platforms.	**10**
Q.4	**(a)**	Give the function of each layer of a seven-layer IoT architectural reference model published by IoTWF architectural committee.	**10**
	(b)	Explain the Enabling IoT Technologies.	**10**
Q.5	**(a)**	Explain Gateways and Backhaul Sublayer considering Layer 2: Communications Network Layer in IoT.	**10**
	(b)	Give the key components of a SCADA system. Describe CoAP message fields.	**10**
Q.6	**(a)**	Describe the application of IoT in Environment.	**10**
	(b)	Compare with suitable factors Particle Photon with ESP32 used for IoT application development.	**10**
