Time: 3 Hours   **Marks: 80**

1) Q.1 is compulsory

2) Attempt any **three** from remaining **five** questions

Q1) Solve any four of the following:

a)   Describe different categories of AI   [5]
b)   Describe the characteristics of a medical diagnosis system using the PEAS properties   [5]
c)   Explain Goal based Agent with a block diagram   [5]
d)   Compare and contrast propositional logic and first order logic   [5]
e)   What do you mean by hill climbing. Explain.   [5]

Q2)
a) Perform α - β pruning on the following graph, clearly indicating the
α and β cuts and the final value of root node.   [10]
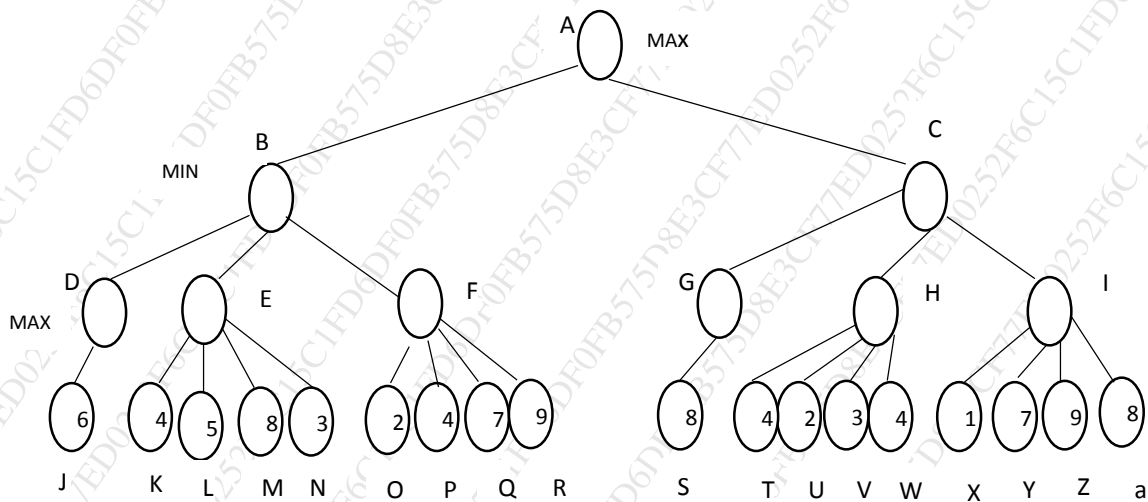
b) What do you understand by informed and uninformed search methods? Explain in detail

with example.   [10]

Q3)
a) Consider the following statements: [10]
      a) All people who are earning are happy
      b) All happy people smile
      c) Someone is earning
      Perform the following tasks:
      i) Represent above statements in FOL
      ii) Convert each to CNF
      iii) Prove that someone is smiling using resolution technique. Draw the resolution tree

b) What do you understand by forward chaining and backward chaining. Explain in   detail

[10]

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Q.4

a) For the given graph, the table below indicates the path costs and the heuristic values. S is the start node and G1, G2 and G3 are the goal nodes. Perform A* search to find the shortest distance path from S to any of the goal nodes. [10]
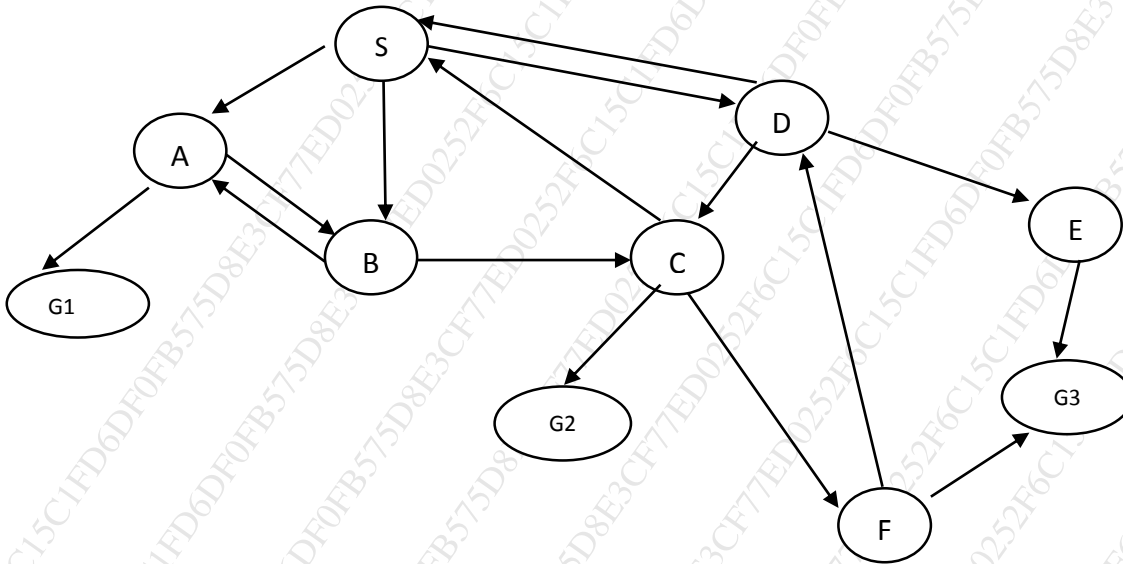
Edge	Cost	Edge	Cost	Edge	Cost
SA	5	BA	2	DS	1
SB	9	BC	1	DC	2
SD	6	CS	6	DE	2
AB	3	CG2	5	EG3	7
AG1	9	CF	7	FD	2
				FG3	8
Node	Heuristic	Node	Heuristic	Node	Heuristic
S	5	D	6	G1	0
A	7	E	5	G2	0
B	3	F	6	G3	0
C	4				

b) What is planning in AI? Discuss partial order planning and hierarchical planning in detail [10]

Q 5)

a) Explain the concept of genetic programming [10]

b) What is formulation of a problem. Formulate the Wumpus world problem in terms of following components: initial state, actions, successor function, goal test, path cost. [10]

Q.6 Write short notes on : [20]

a) Applications of AI

b) Simulated annealing

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

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

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Q.1.   **A.**   What is three-address code? Generate three-address code for –   **5**

```
while (a<b) do
    if(c<d) then
        x:=y+z
    else
        x:=y-z
```

     B.   Compare between Compiler and Interpreter.   **5**
     C.   Explain absolute loader. State its advantages and disadvantages.   **5**
     D.   Discuss with example 'forward reference'.   **5**

Q.2.   **A.**   Construct SLR parser for the following grammar and parse the input   **10**
        "( )( )": $S \rightarrow (S)S \mid \varepsilon.$
     B.   State and explain with examples, different types of statements used in   **10**
        assemblers with respect to system programming.

Q.3.   **A.**   Explain the concept of basic blocks and flow graph with example the   **10**
        three-address code.
     B.   Explain with help of a flowchart, the first pass of two-pass macro   **10**
        processor.

Q.4.   **A.**   Explain the phases of a compiler. Discuss the action taken in various   **10**
        phases to compile the statement:
        a=b*c+10, where, a, b, c are of type real.
     B.   Write short note on: **10**
           (i) Syntax-directed Translation,   (ii) Macro facilities

Q.5.   **A.**   What is code optimization? Explain with example, the following code   **10**
        optimization techniques:
         (i) Common sub-expression elimination   (ii)Code motion
         (iii) Dead code elimination   (iv)Constant propagation
     B.   Explain Direct Linking Loader in suitable example.   **10**

Q.6.   **A.**   Test whether following grammar is LL(1) or not. If it is LL(1), construct   **10**
        parsing table for the same:
           S→1AB|ε
           A→1AC|0C
           B→0S
           C→1
     B.   Draw and explain the flowchart of Pass-I of two pass assembler with   **10**
        suitable example.

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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.
        (4) Assume suitable data, if required and state it clearly.

1   Attempt any FOUR   [20]
  a   Explain the relationship between Security Services and Mechanisms in detail.
  b   Explain ECB and CBC modes of block cipher.
  c   Define non-repudiation and authentication. Show with example how it can be achieved.
  d   Explain challenge response-based authentication tokens.
  e   Explain buffer overflow attack.

2 a Elaborate the steps of key generation using the RSA algorithm. In RSA system the   [10]
      public key (E, N) of user A is defined as (7,187). Calculate $\Phi(N)$ and private key 'D'.
      What is the cipher text for M=10 using the public key.

   b Discuss DES with reference to following points   [10]
      1. Block size and key size
      2. Need of expansion permutation
      3. Role of S-box
      4. Weak keys and semi weak keys
      5. Possible attacks on DES

3 a What goals are served using a message digest? Explain using MD5.   [10]
   b What is DDOS attack? Explain how is it launched.   [10]

4 a Why are digital certificates and signatures required? What is the role of digital signature [10]
      in digital certificates? Explain any one digital signature algorithm.
   b How does PGP achieve confidentiality and authentication in emails?   [10]

5 a State the rules for finding Euler's phi function. Calculate   [10]
      a. $\varphi(11)$
      b. $\varphi(49)$
      c. $\varphi(240)$
   b Explain Kerberos. Why is it called as SSO?   [10]

6 a Enlist the various functions of the different protocols of SSL. Explain the phases of [10]
      handshake protocol.
   b How is security achieved in Transport and Tunnel modes of IPSEC? Explain the role of   [10]
      AH and ESP.

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(**3 Hours**)   (**Maximum Marks: 80**)

NB. 1. **Question** number **One** is compulsory
    2. Attempt **any three out of remaining five** questions
    3. Assume suitable data
    4. Figures to the right indicate the maximum marks

Q1   **Attempt any FOUR:**   (**20**)

    a) Define and classify Cybercrime

    b) Comment on Windows OS Artifacts

    c) Explain Principles of Digital Forensic.

    d) Which are the Goals of Incident Response

    e) How to Acquire Image over a Network

Q2 a) Explain Digital Forensics and its lifecycle.   (**10**)

    b) Explain in detail Incidence Response Methodology   (**10**)

Q3 a) Describe Steps to prevent cybercrime and explain Hackers, Crackers and Phreakers (**10**)

    b) Explain Forensic Investigation Report Writing in terms of Standards, Content, Style, (**10**)
        Formatting and Organization.

Q4 a) Describe Digital Investigation Staircase Model   (**10**)

    b) How to Acquire an Image with dd Tools and with Forensic Formats   (**10**)

Q5 a) Describe in details OS File Systems.   (**10**)

    b) Explain Network-Based Evidence acquisition and its analyzing.   (**10**)

Q6 a) Explain Need and types of Computer Forensic Tools in detail.   (**10**)

    b) In Mobile Forensics explain Challenges, Evidence Extraction Process, Types of (**10**)
        Investigation, and Procedure for Handling an Android Device.

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

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Instructions:
1) Solve any FOUR questions.
2) All question carries equal marks.
3) Figures to the right indicate full marks.
4) Assume suitable additional data, if necessary and clearly state it.

Q. 1 a) Discuss IOTWF Standardized Architecture. (5 M)
  b) Explain Raspberry Pi with diagram. (5 M)
  c) Describe Zigbee protocol stack using IEEE 802.15.4. (10 M)

Q.2 a) What are gateways and backhaul sub layers? (5 M)
  b) Briefly explain Adapting SCADA for IP. (5 M)
  c) What do you mean by SoC? Also explain its applications. (10 M)

Q.3 a) Describe various health & lifestyle domain specific IOT. (5 M)
  b) Explain the different pin/parts of Arduino Uno board. (5 M)
  c) Describe data vs. network analytics for an IoT network. (10 M)

Q.4 a) Write short notes on BLE. (5 M)
  b) Differentiate between Sensors and actuators with neat diagram. (5 M)
  c) What is IoT? Explain IoT blocks in detail. List out the different IOT Challenges. (10 M)

Q.5 a) Explain IOT Application layer with a neat diagram. (5 M)
  b) Discuss the concept of Edge computing. (5 M)
  c) Explain MQTT. Compare - COAP and MQTT. (10 M)

Q.6 a) Describe Architecture of Wireless Sensor Network. (5 M)
  b) Explain different Energy related IOTs Domain with example. (5 M)
  c) What are IOT software platform? Explain in short with an example. (10 M)

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27003

(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) Define Statistics and list the limitations of statistics.
b) Explain sampling and purpose of sampling.
c) What is regression analysis? How does it differ from correlation
d) Show that sample variance (S^2) is an unbiased estimator of population
    variance (σ^2). Also illustrate with an example.

Q2 a) In a laboratory experiment on correlation research study, the equations to   10
        the two regression lines were found to be 2x-y + 1 = 0 and 3x-2y+7 = 0.
        Find the mean of x and y. Also work out the values of regression
        coefficients and correlation coefficient between the two variables x and y.
    b) The frequency distribution of scores obtained by 250 candidates in an   10
        entrance tests is as follows. Draw a less than and more than frequency
        curve (ogive) to represent the given data. Also what is the significance of
        the point of intersection of the two ogive curves?

Scores	Number of candidates
400 – 450	25
450 – 500	30
500 – 550	45
550 – 600	37
600 – 650	30
650 – 700	33
700 – 750	15
750 – 800	35

Q3 a) The following table gives the age of cars of a certain make and annual   10
        maintenance costs. Obtain the regression equation for Maintenance costs,
        taking age of the car as the independent variable. Also find the
        maintenance cost for Age of the car = 5 years

Age of cars (in Years)	Maintenance cost (In thousands of rupees)
2	10
4	20
6	25
8	30

    b) Explain with illustration the concept of Point estimation   10

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Q4   a)   Following is the data about the weights in Kgs of 10 Shipments (X_1), the   10
          distances they were moved (X_2) and the damage that was incurred (Y).
     i)   Fit a regression $\hat{Y} = a + b_1X_1 + b_2X_2$
     ii)   Find the coefficient of multiple determination (R^2).
     iii)   Also test the significance of regression (Given the appropriate
            Table value, F = 9.55, for a significance level of $\alpha = 0.01$)

Shipment	Damage (thousands of Rs) (Y)	weights in Kgs (X_1)	Distance moved in Km (X_2)
1	12	17	10
2	15	15	6
3	14	15	10
4	19	10	21
5	8	13	8
6	16	15	13
7	15	11	9
8	25	6	25
9	10	15	10
10	11	7	8

      b)   Explain primary data and secondary data in detail   10

Q5   a)   Given $r_{12} = 0.7$, $r_{13} = 0.61$ and $r_{23} = 0.4$. Compute i) $r_{23.1}$, ii) $r_{13.2}$, iii) $r_{12.3}$ 10
      b)   Differentiate between the following pair of concepts: 10
           i)   Critical Region and Region of acceptance.
           ii)   Null Hypothesis and Alternative Hypothesis

Q6   Write short note on   20
      a)   Pie chart and its advantages and disadvantages
      b)   Method of moments
      c)   Multiple Regression
      d)   Neyman Pearson Lemma

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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.
      (4) Assume suitable data, if required and state it clearly.

1   Attempt any FOUR [20]

  a   Explain Categorical data and quantitative data.

  b   Find S.D of the average temperature recorded over a five-day period last winter
     18,22,19,25,12

  c   Define Binomial distribution and Poisson distribution.

  d   Explain Type1 and Type 2 error in detail.

  e   Define the following key terms for simple linear regression.
     i)Response ii) Record iii) Independent variable iv) Regression co-efficient v)
     Residuals

2 a   The runs scored in a cricket match by 11 players are as [10]
     follows:7,16,121,51,101,81,1,16,9,11,16.
     Find mean, mode, median for the given data.

  b   An agent sells life insurance policies to five equally aged healthy people. [10]
     According to recent data, the probability of a person living in these conditions
     for 30 years or more is 2/3.Caluclate the probability that after 30 years if

     i)   All five people are still living.

     ii)   At least three people are still living.

     iii)   Exactly two people are still living (Hint: Binomial Distribution)

3 a   X is a normally distributed variable with mean $\mu=30$ S. D $\sigma=4$.Find i) $P(X<40)$ [10]
     ii)$P(X>21)$ iii) $P(30<X<35)$

  b   Brief the steps in multinomial distribution goodness of fit. Elaborate the steps [10]
     with an example.

4 a   Brief the steps in test of independence. Elaborate the steps with an example [10]

  b   Find the simple linear regression that fits the given data and co efficient of [10]
     determination.

Bill	34	108	64	88	99	54
Tip	5	17	11	8	14	5

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5 a In the context of multiple linear regression. Explain what is over fitting and multi   [10]
       collinearity.

   b Predict equation for y.   [10]

y	x1	x2
-3.7	3	8
3.5	4	5
2.5	5	7
11.5	6	3
5.7	2	1

6 a Explain TIME SERIES PATTERNS   [10]

       i)Horizontal Pattern ii) Trend Pattern iii)Seasonal Pattern

       iv)Trend and Seasonal Pattern v)Cyclical Pattern

   b Consider the following time series data.   [10]

Week	1	2	3	4	5	6
Value	18	13	16	11	17	14

Using the naive method (most recent value) as the forecast for the next week,

compute the following measures of forecast   accuracy.

i) Mean absolute error.   ii) Mean squared error.

iii) Mean absolute percentage error.   iv) Determine the forecast for week 7?

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