

Artificial Intelligence

Time: 3 Hours

Max Marks: 60

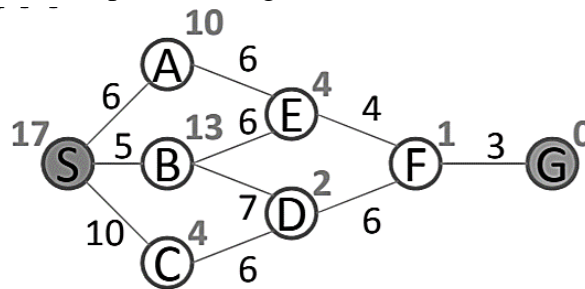
Note: Answer ALL questions from Part-A & Part –B (Internal Choice) at one place in the same order

Part - A
(5Q X 3M = 15 Marks)

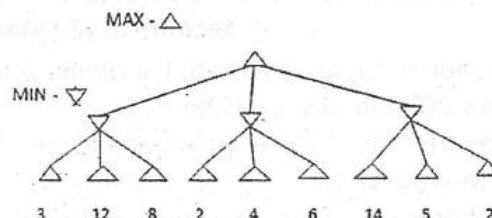
		M	CO	BT
1	What is an uninformed search strategy?	(3)	1	1
2	What is the best approach for game playing problems?	(3)	2	2
3	Define semantic tableau.	(3)	3	1
4	What is the need for probability theory in uncertainty?	(3)	4	1
5	State the importance of truth maintenance system.	(3)	5	2

Part – B
(5Q X 9M = 45 Marks)

		M	CO	BT
6	(a) How to define a problem as state space search? Discuss it with the help of an example.	(5)	2	2
	(b) Discuss in brief about the history of AI.	(4)	1	1
	(OR)			
7	(a) Explain Breadth-first search algorithm with an example.	(4)	2	1
	(b) In the graph below the start state is S, and the goal state is G. The transition costs are next to the edges, and the heuristic estimate, h, of the distance from the state to the goal is next to the vertex (bold). What is the order of states expanded using A* search.	(5)	2	4



8	(a) Define heuristic function. Explain how it can be applied in searching.	(5)	2	2
	(b) Explain the procedure of simulated annealing search.	(4)	2	3
	(OR)			
9	(a) Discuss how game theory functions can be applied to achieve optimal decisions.	(5)	3	3
	(b) Apply the Alpha Beta procedure and determine the outcome for MAX by specifying the nodes which are not generated.	(4)	3	4



- 10 Prove by resolution refutation the following example: (9) 3 4
- 1) Every child loves every candy.
 - 2) Anyone who loves some candy is not a nutrition fanatic.
 - 3) Anyone who eats any pumpkin is a nutrition fanatic.
 - 4) Anyone who buys any pumpkin either carves it or eats it.
 - 5) John buys a pumpkin.
 - 6) Lifesavers is a candy.
 - 7) (Conclusion) If John is a child, then John carves some pumpkin.

(OR)

- 11 (a) Explain how Frames can be used for knowledge representation. (5) 3 4
 (b) What is an extended semantic network? State its advantages. (4) 3 3

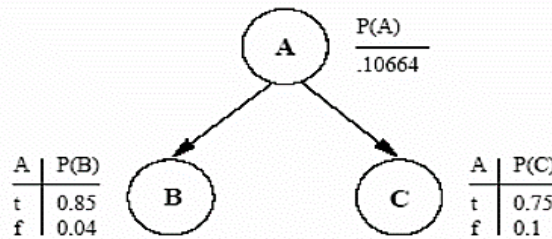
- 12 (a) Machines A and B produce 10% and 90% respectively of the production of a component intended for the motor industry. From experience, it is known that the probability that machine A produces a defective component is 0.01 while the probability that machine B produces a defective component is 0.05. If a component is selected at random from a day's production and is found to be defective, find the probability that it was made by (a) machine A; (b) machine B. (5) 4 3

- (b) State the advantages of using hidden markov model. (4) 4 2

(OR)

- 13 (a) Consider the following Bayesian Network containing 3 Boolean random variables: $P(A)=0.10664$, $P(B=t)=0.85$, $P(B=f)=0.04$, $P(C=t)=0.75$, $P(C=f)=0.1$. (5) 4 3

Compute the following quantities: (i) $P(\sim B, C | A)$ (ii) $P(A | \sim B, C)$



- (b) What is utility theory? State its advantages. (4) 4 2

- 14 (a) Differentiate between expert systems and traditional systems. (5) 5 2
 (b) Briefly discuss about expert system architecture. (4) 5 3

(OR)

- 15 (a) What is a machine learning system? How is it useful? (5) 6 2
 (b) Explain various types of learning paradigms. (4) 6 2



Code No.: 20CSC13

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.E. IV Sem (Main) Examination July/August 2022

Computer Architecture and Microprocessor

(Common to CSE, CSE-AI & ML, CSE-IoT & CS Including BCT)

Time: 3 Hours

Max Marks: 60

Note: Answer ALL questions from Part-A & Part –B (Internal Choice) at one place in the same order

Part - A (5Q X 3M = 15 Marks)

	M	CO	BT
1 Illustrate the logic circuit of Binary addition/subtraction.	(3)	1	2
2 Outline the five-step sequence of actions to fetch and execute an instruction.	(3)	1	2
3 Register AL has 55H, Register BL holds BCH and CY=1 then illustrate the following: RAR AX,03H ADC AL, BL MUL BL (Assume BH=00H)	(3)	6	3
4 Summarize the Data hazards in pipelining.	(3)	5	2
5 What is the significance of Static RAM.	(3)	4	1

Part – B (5Q X 9M = 45 Marks)

	M	CO	BT
6 (a) Explain the Multiplication of positive numbers using Sequential circuit binary multiplier using a neat diagram.	(4)	2	2
(b) State how to detect overflow when subtracting two numbers using 2's-complement representation. Use a suitable numerical example for answer.	(5)	1	1
(OR)			
7 (a) Explain the process of non-restoring division with example.	(4)	1	2
(b) Assuming 6-bit 2's-complement number representation, multiply the multiplicand A = 110101 by the multiplier B = 011011 using the Booth algorithm.	(5)	1	3
8 (a) Illustrate Processing unit hardware structure with multiple stages.	(4)	2	2
(b) Describe the process of control signals generation for the Datapath.	(5)	2	2
(OR)			
9 (a) Illustrate the internal architecture of 8086 Microprocessor with a neat diagram.	(5)	6	2
(b) Demonstrate the Addressing Modes of 8086 Microprocessor.	(4)	6	2
10 (a) Demonstrate the Logical and shift instructions with suitable example.	(4)	3	2
(b) Illustrate the branch instructions of 8086 Microprocessor.	(5)	6	2

(OR)

- 11 (a) Explain the various types of interrupts in 8086 Microprocessor. (4) 6 2
(b) Consider the following possibilities for saving the return address of a subroutine: (5) 6 4
- i. In a processor register
 - ii. In a memory location associated with the call, so that a different location is used when the subroutine is called from different places
 - iii. On a stack
- Which of these possibilities supports subroutine nesting and which supports subroutine recursion (that is, a subroutine that calls itself)?

- 12 (a) Explain the sequence of events that are followed by the SCSI controller in reply to the processor, when the processor seeks to read a block of data stored in two different sectors which are not continuous. (4) 4 2
(b) Illustrate the superscalar processor with two execution units. (5) 4 2

(OR)

- 13 (a) Demonstrate the Arithmetic Pipeline with suitable example. (4) 4 2
(b) Explain the series of actions that a DMA controller will perform after it receives a request from a peripheral device to transfer data from the peripheral device to memory. (5) 4 2

- 14 (a) The purpose of using an L2 cache is to reduce the miss penalty of the L1 cache, and in turn to reduce the memory access time as seen by the processor. An alternative is to increase the size of the L1 cache to increase its hit rate. What limits the utility of this approach? Give proper justifications for your answer. (4) 5 3
(b) Suppose that a computer has a processor with two L1 caches, one for instructions and one for data, and an L2 cache. Let τ be the access time for the two L1 caches. The miss penalties are approximately 15τ for transferring a block from L2 to L1, and 100τ for transferring a block from the main memory to L2. For the purpose of this problem, assume that the hit rates are the same for instructions and data and that the hit rates in the L1 and L2 caches are 0.96 and 0.80, respectively.
- i. What fraction of accesses miss in both the L1 and L2 caches, thus requiring access to the main memory?
 - ii. Suppose that the L2 cache has an ideal hit rate of 1. By what factor would this reduce the average memory access time as seen by the processor?

(OR)

- 15 (a) Explain the Direct, Associate and Set-associate mapping techniques. (5) 5 2
(b) Demonstrate the structure of general purpose of multiprocessors. (4) 5 2

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)**B.E. (CSE) IV Sem (Main) Examination July/August 2022****Data Base Management Systems****(Common to CSE, CSE - AI&ML, CSE - IoT&CS Including BCT)****Time: 3 Hours****Max Marks: 60****Note:** Answer ALL questions from **Part-A & Part –B (Internal Choice)** at one place in the same order**Part - A****(5Q X 3M = 15 Marks)**

	M	CO	BT
1 Illustrate Participation and Cardinality constraints in ER Diagram with examples.	(3)	1	1
2 Describe CHECK and DEFAULT constraint with examples?	(3)	2	1
3 What are the uses of Indexing in databases.	(3)	3	1
4 Explain Lossless join Decomposition with example.	(3)	4	2
5 What is Log? Explain with example.	(3)	5	1

Part – B**(5Q X 9M = 45 Marks)**

	M	CO	BT
6 (a) What are the different types of Data Models in DBMS? Explain them.	(5)	1	1
(b) Illustrate Participation and Cardinality constraints in ER Diagram with examples.	(4)	1	2

(OR)

7 (a) Discuss the different database users and their roles.	(5)	1	4
(b) Draw an ER diagram of Hospital or Bank with showing the Specialization, Aggregation, and Generalization.	(4)	1	2
8 (a) Explain all database languages in detail with example.	(5)	2	2
(b) Consider the following relation. The Primary key is Rollno, Isbn, Student(RollNo, Name, Branch), Book(Isbn, Title, Author, Publisher) Issue(Rollno, Isbn, te_of_issue). Write the query in Relational algebra and SQL of the following. i. List the Roll Number and Name of All CSE Branch Student. ii. Find the name of students who have issued a book of publication 'BPB'. iii. List the title and author of all books which are issued by a student name started with a. iv. List the title of all books issued on or before 20/09/2012. v. List the name of student who will read the book of author named 'Sanjeev'.	(4)	2	3

(OR)

9 (a) Write difference between cross join, natural join, left outer join and right outer join.	(5)	2	3
(b) State the procedural DML and nonprocedural DML with their differences.	(4)	2	1

- 10 (a) What do you understand by transitive dependencies? (5) 3 1
(b) Explain any two problems that can arise in the database if transitive dependencies are present in the database with example. (4) 3 2
- (OR)**
- 11 (a) Explain the Primary Key, Super Key, Foreign Key and Candidate key with example. (5) 3 2
(b) Short Notes of the Following: (4) 3 1
i) MVD or JD
ii) Normalization with advantages.
- 12 (a) What are multi version schemes of concurrency control? Describe with the help of an example. (5) 4 1
(b) Discuss the various Time stamping protocols for concurrency control. (4) 4 4
- (OR)**
- 13 (a) Given a schedule S for transactions T1 and T2 with set of read and write operations, S: R1(X) R2(X) R2(Y) W2(Y) R1(Y) W1(X). Identify, whether given schedule is equivalent to serial schedule or not? (5) 4 3
(b) What is a Schedule? Explain Phantom Phenomena associated with concurrent transactions. (4) 4 1
- 14 (a) Discuss Two Phase Locking protocol, its advantages and disadvantages. (5) 5 4
(b) Discuss the procedure of deadlock detection and recovery in transaction? (4) 5 4
- (OR)**
- 15 (a) Discuss 2 phase commit (2PC) protocol and time stamp based protocol with suitable example. (5) 6 4
(b) Describe check pointing technique and its advantages with example. (4) 6 1

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)**B.E. IV Sem (Main) Examination July/August 2022****Engineering Economics and Accountancy****(Common to CSE, CSE-AI & ML, CSE-IoT & CS Including BCT, IT & AI&DS)****Time: 3 Hours****Max Marks: 60****Note:** Answer ALL questions from **Part-A & Part –B (Internal Choice)** at one place in the same order**Part - A**
(5Q X 3M = 15 Marks)

		M	CO	BT
1	Outline how managerial economics helps in solving managerial problems?	(3)	1	2
2	Explain income elasticity of demand?	(3)	2	1
3	Define production function and list out variable inputs under it.	(3)	3	1
4	Define journal and write its proforma.	(3)	4	1
5	What is the need for capital?	(3)	5	1

Part – B
(5Q X 9M = 45 Marks)

		M	CO	BT
6	(a) Analyze how managerial economics has its roots in economics and management. Does it have any links with other subjects? Justify.	(5)	1	4
	(b) Explain the scope of managerial economics.	(4)	1	2
	(OR)			
7	(a) Distinguish between discounting principle and negotiation principle.	(5)	1	4
	(b) Demonstrate the usefulness of managerial economics to engineers.	(4)	1	2
8	(a) What do you understand by ‘elasticity of demand’? Explain its practical significance.	(5)	2	2
	(b) Classify elasticity of demand with examples.	(4)	2	4
	(OR)			
9	(a) Examine the assumptions of law of demand.	(5)	2	4
	(b) Explain survey based demand forecasting methods with appropriate examples.	(4)	2	2
10	(a) Illustrate the internal economies of scale that accrue to a firm.	(5)	3	2
	(b) Categorize the Laws of returns with appropriate examples.	(4)	3	3
	(OR)			
11	(a) Illustrate the price output determination in case of monopoly.	(5)	3	2
	(b) What are the key terms used in Break-even analysis? Mention its assumptions.	(4)	3	1

- 12 (a) Discuss types of account and rules governing each account. (5) 4 2
 (b) From the books of Kamal for the year ending December 31, 2005, (4) 4 3
 Prepare a trading account.

Trial balance as on December 31, 2005

Particulars	(Rs.)	(Rs.)
Sales		325000
Purchases	240000	
Purchase returns		5600
Sales returns	5000	
Freight	5000	
Wages	40000	
Carriage inwards	10000	
Salaries	20000	
Opening stock (1.1.2005)	25000	

Adjustments: Stock as on 31.12.2005 was 40000.

(OR)

- 13 (a) Journalize the following transactions in the books of Madhu. (5) 4 3
 2003 January 1. Madhu commenced with Rs. 15000/-.
 2. Paid into Bank Rs.10000/-.
 3. Purchased goods from 'B' for Rs.2000/-.
 4. Returned goods to 'B' for Rs.200/-.
 5. Paid to 'B' in full settlement of A/C Rs.1700/-.
 6. Received interest from the Bank Rs.750/-.
 7. Sold goods for cash Rs.7000/-
 8. Sold goods to Don for Rs.4000/-.

- (b) Summarize advantages of using double-entry book keeping system. (4) 4 2

- 14 (a) The cost of a project is Rs.50000 which has an expected life of 5 years. (5) 5 3
 The cash inflows for next 5 years are Rs.24000, Rs.26000, Rs.20000,
 Rs.17000, Rs.16000 respectively. Determine the payback period.

- (b) Explain the main features of different sources of short-term finance. (4) 5 2

(OR)

- 15 (a) Examine various factors affecting requirements of working capital. (5) 5 4
 (b) Mention different features of fixed capital. (4) 5 1



Code No.: 20CSC15

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)

B.E. IV Sem (Main) Examination July/August 2022

Internet and Web Technologies

(Common to CSE, CSE-AI & ML, CSE-IoT & CS Including BCT)

Time: 3 Hours

Max Marks: 60

Note: Answer ALL questions from Part-A & Part –B (Internal Choice) at one place in the same order

Part - A (5Q X 3M = 15 Marks)

	M	CO	BT
1 What is a web server? List any three web servers.	(3)	1	2
2 Write a XHTML program to display a list in the following format	(3)	2	3
• Fruit			
○ Bananas			
○ Apples			
▪ Green			
▪ Red			
○ Pears			
• Vegetables			
3 Write JavaScript code to validate an email address.	(3)	3	2
4 What kind of architecture is used by Django. Explain in short.	(3)	4	2
5 Which architecture does fuelPHP follow? What is its significance?	(3)	1	2

Part – B (5Q X 9M = 45 Marks)

	M	CO	BT
6 (a) Draw and explain MVC architecture.	(5)	1	2
(b) Write the steps involved in deploying a web application on a server.	(4)	1	2
(OR)			
7 (a) What is URL? How is it different from URI? Describe the HTTP response format.	(5)	1	2
(b) Explain various server side and client-side scripting languages that facilitate web app development.	(4)	4	2
8 (a) Write HTML code to create a webpage with a form to accept the details of a student: Name, address, Sex (Male/ Female), Date of Birth, Electives (Check box), and Branch (chosen from a list box). Provide submit and Reset buttons on it. Apply CSS to display background color blue, foreground color red.	(5)	3	3
(b) Write XML document for holding invoice details that include invoice number, item1, item2, item3, amount, tax, total amount and write DTD.	(4)	3	3

(OR)

- 9 (a) Why namespaces in XML? Write XML Schema with root element as orders that contains order with orderId, city, payment method and items. Items have subitems as item (could occur multiple times based on the no. of items purchased by the customer), price and quantity. (5) 3 2
- (b) Why CSS? Explain different types of CSS selectors with an example. (4) 2 3
- 10 (a) What is DOM in JavaScript? What are different ways in which elements can be positioned? Explain with an example. (5) 3 2
- (b) Write JavaScript code to display “Hai Mr./Ms. NAME, Good Morning/Afternoon/Evening, Age”. Name and DOB to be collected from the user and age must be computed. Greeting must be based on time. (4) 3 3
- (OR)**
- 11 (a) What type of events are supported for keyboard and mouse in JavaScript? Give an example to handle keyboard and mouse events. (5) 3 2
- (b) Write HTML program to create a form with name, age, and email-id. Write a JavaScript program to validate these fields with constrains such as Name can have alphabets and number with max. size as 20 characters, age value must be between 1 to100 and email-id should end with “@gmail.com”. (4) 3 3
- 12 (a) Explain the advantages and disadvantages of Django framework. (5) 4 2
- (b) How to create a template in Django? Write steps to read data from database using Django. (4) 4 2
- (OR)**
- 13 (a) What is session? How to enable session in Django and save the session data? Write a program to handle sessions. (5) 5 3
- (b) Write a program to create a form to collect name, email-id, course name and store them in database using Django. (4) 5 3
- 14 (a) What is NodeJS? Write a NodeJS program to print “Hello World”. (5) 4 2
- (b) Discuss the significance of Bootstrap and write any program to demonstrate significance of Bootstrap. (4) 5 3
- (OR)**
- 15 (a) What is the purpose of a framework? Explain the architecture followed by Angular. (5) 5 2
- (b) List out the steps to be followed in writing AJAX program also write any AJAX program to demonstrate its significance. (4) 5 3

Mathematical Foundation for Data Science and Security**(Common to CSE, CSE-AI & ML, CSE-IoT & CS Including BCT)****Time: 3 Hours****Max Marks: 60****Note:** Answer ALL questions from **Part-A & Part –B (Internal Choice)** at one place in the same order**Part - A**
(5Q X 3M = 15 Marks)

- | | | M | CO | BT | | | | | | | | | | | | |
|--------|---|----------|-----------|-----------|--------|---|---|--------|-----|------|------|-------|--------|--|--|--|
| 1 | Find the first two moments about the mean for the series 4,5,6,1,4. | (3) | 1 | 2 | | | | | | | | | | | | |
| 2 | A random variable X has the following probability distribution. | (3) | 2 | 2 | | | | | | | | | | | | |
| | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>$P(X)$</td> <td>C</td> <td>$2C$</td> <td>$2C$</td> <td>C^2</td> <td>$5C^2$</td> </tr> </table> | X | 0 | 1 | 2 | 3 | 4 | $P(X)$ | C | $2C$ | $2C$ | C^2 | $5C^2$ | | | |
| X | 0 | 1 | 2 | 3 | 4 | | | | | | | | | | | |
| $P(X)$ | C | $2C$ | $2C$ | C^2 | $5C^2$ | | | | | | | | | | | |
| | Find (i) C and (ii) the distribution function of X . | | | | | | | | | | | | | | | |
| 3 | Find the mean of Uniform distribution. | (3) | 3 | 2 | | | | | | | | | | | | |
| 4 | Find the remainder when 79^{160} is divided by 100. | (3) | 4 | 2 | | | | | | | | | | | | |
| 5 | Define the terms (i) encryption and (ii) decryption. | (3) | 5 | 1 | | | | | | | | | | | | |

Part – B
(5Q X 9M = 45 Marks)

- | | | M | CO | BT | | | | | | | | | | | | | | | | | | | | |
|-----|---|----------|-----------|-----------|----|----|-----|----|----|-----|----|-----|---|----|----|----|----|----|----|----|----|--|--|--|
| 6 | (a) Compute Karl Pearson's coefficient of skewness from the following data: | (5) | 1 | 3 | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> </tr> <tr> <td>f</td> <td>3</td> <td>6</td> <td>9</td> <td>13</td> <td>8</td> <td>5</td> <td>4</td> </tr> </table> | x | 6 | 7 | 8 | 9 | 10 | 11 | 12 | f | 3 | 6 | 9 | 13 | 8 | 5 | 4 | | | | | | | |
| x | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | | | | | | | | | | | | | | | |
| f | 3 | 6 | 9 | 13 | 8 | 5 | 4 | | | | | | | | | | | | | | | | | |
| | (b) Obtain an approximation of the form $y = a + bx$ for the following data: | (4) | 1 | 3 | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>y</td> <td>14</td> <td>27</td> <td>40</td> <td>55</td> </tr> </table> | x | 1 | 2 | 3 | 4 | y | 14 | 27 | 40 | 55 | | | | | | | | | | | | | |
| x | 1 | 2 | 3 | 4 | | | | | | | | | | | | | | | | | | | | |
| y | 14 | 27 | 40 | 55 | | | | | | | | | | | | | | | | | | | | |
| | (OR) | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | From the following data, calculate the correlation coefficient and obtain the two regression lines. | (9) | 1 | 3 | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> </tr> <tr> <td>Y</td> <td>9</td> <td>8</td> <td>10</td> <td>12</td> <td>11</td> <td>13</td> <td>14</td> <td>16</td> <td>15</td> </tr> </table> | X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Y | 9 | 8 | 10 | 12 | 11 | 13 | 14 | 16 | 15 | | | |
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | | | | | | | | | | | | | | |
| Y | 9 | 8 | 10 | 12 | 11 | 13 | 14 | 16 | 15 | | | | | | | | | | | | | | | |
| 8 | (a) Bag A contains 3 white and 2 red balls and bag B contains 5 white and 4 red balls. One ball is drawn at random from one of the bags and it is found to be white. Find the probability that the white ball is drawn from bag A. | (5) | 2 | 3 | | | | | | | | | | | | | | | | | | | | |
| | (b) A continuous random variable x has the p.d.f. | (4) | 2 | 3 | | | | | | | | | | | | | | | | | | | | |
| | $f(x) = \begin{cases} a+bx, & 0 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases}$ | | | | | | | | | | | | | | | | | | | | | | | |
| | If the mean of the distribution is $\frac{1}{3}$, find the values of a and b . | | | | | | | | | | | | | | | | | | | | | | | |

(OR)

- 9 (a) If X is a random variable, prove that (i) $E(aX + b) = aE(X) + b$ and (5) 2 2
(ii) $Var(aX + b) = a^2Var(X)$.
- (b) If a Poisson distribution is such that $\frac{3}{2}P(X = 1) = P(X = 3)$, then find (4) 2 2
(i) $P(X \geq 1)$ and (ii) $P(2 \leq X \leq 5)$.
- 10 (a) Write the characteristics of normal distribution. (3) 3 1
(b) A sample of 100 dry battery cells tested to find the length of life (6) 3 4
produced the following results:
 $\bar{x} = 12$ hours, $\sigma = 3$ hours.
Assuming the data to be normally distributed, what percentage of
battery cells are expected to have life i) more than 15 hours,
ii) between 10 and 14 hours.
- (OR)**
- 11 (a) Find MGF and CGF of exponential distribution. (5) 3 2
(b) If X is uniformly distributed over $(-3, 3)$, then determine k such that (4) 3 3
 $P(X > k) = 1/3$.
- 12 (a) Find the general solution of the Diophantine equation $6x + 5y = 22$. (5) 4 2
(b) Prove that every positive integer other than one has a prime factor. (4) 4 2
- (OR)**
- 13 (a) State and prove Wilson's theorem. (5) 4 2
(b) If p is prime, then prove that $2(p - 3)! + 1$ is divisible by p . (4) 4 3
- 14 Write Pollard's $p-1$ factorization algorithm and hence determine the (9) 5 4
factors of 91.
- (OR)**
- 15 (a) Determine the public key, private key and cypher text for the primes (5) 5 3
 $p = 5, q = 7$ and plain text $m = 13$.
(b) Find the quadratic residues and quadratic nonresidues modulo 11. (4) 5 2
