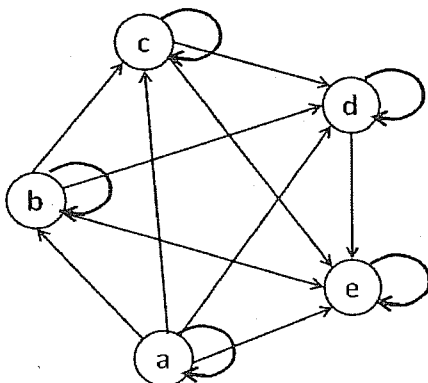


M.C.A. I Semester Supplementary Examinations, July/August 2014**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE****Time: 3 hours****Max Marks: 60**

*Answer any FIVE of the following
All questions carry equal marks (12 Marks each)*

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1. a) Construct the Truth table for the formula $\neg(P \wedge Q) \leftrightarrow (\neg P \vee \neg Q)$ 6M
 b) What is the principle disjunctive normal form? Obtain the principle disjunctive normal form of $(\neg P \vee \neg Q) \rightarrow (P \leftrightarrow \neg Q)$ 6M
2. a) (i) Translate the following predicate calculus formula into English sentence
 $\forall x [C(x) \vee \exists y (C(y) \wedge F(x, y))]$. Here $C(x)$: x has a computer, $F(x, y)$: x and y are friends. The universe for both x and y is the set of all students of your college. (ii) Write the negations for each of the following using quantifiers
 I) "Real number x, if $x > 3$ then $x^2 > 9$ ".
 II) Integers a, b and c if a - b is even and b - c is even then a - c is even. 6M
 b) Show that $R \vee S$ follows logically from the premises
 $C \vee D, (C \vee D) \rightarrow \sim H, \sim H \rightarrow (A \wedge \sim B)$ and $(A \wedge \sim B) \rightarrow (R \vee S)$. 6M
3. a) (i) If A, B, C are three sets such that $A \subseteq B$. Show that $(A \times C) \subseteq (B \times C)$
 (ii) If $A = \{1,2,3\}$ $B = \{4,5\}$. Find
 I. $\bar{A} \times B$
 II. $B \times A$ 6M
 b) Prove that $A - (B \cap C) = (A - B) \cup (A - C)$ 6M
4. a) i) Given $A = \{a, b, c\}$ and $R = \{(a, a), (a, b)\}$, is R transitive? Justify
 ii) Let $A = \{a, b, c, d, e\}$ and the following diagram represents the diagram of the partial order relation on A. Draw Hasse diagram showing the steps.



6M

- b) i) Find the Domain, and range of the following : $f(x)=x^2+x$
 ii) State whether or not each of the relations given below defines a function of $A = \{a, b, c\}$ into $B = \{1, 2, 3\}$.
- i. $f = \{(a, 2), (a, 3), (b, 3), (c, 1)\}$
 ii. $f = \{(a, 2), (b, 3)\}$
 iii. $f = \{(a, 1), (b, 3), (c, 1)\}$
 iv. $f = \{(a, 1), (b, 2), (c, 3)\}$ 6M
5. a) Define a Group and Subgroup? In the group $\{2, 4, 6, 8\}$ under multiplication module 10, what is the identity element? 6M
 b) Prove that $G = \{1, w, w^2\}$ is a group w.r.to multiplication where $1, w, w^2$ are cubes of unity ($w^3=1$). 6M
6. a) (i) Find the coefficient of x^3 in $(1+x+2x^2)(1-2x)^5$.
 (ii) State the Binomial and multinomial theorems 6M
- b) Find the number of arrangements of all 7 letters of the word "MINIMUM" in which
 i) There are no restrictions.
 ii) The 3 letters M are next to each other
 iii) The 3 letters M are separate
 iv) The first letter is M
 v) The first & last letters are M the first letter is M or the last letter is M or both 6M
7. a) Consider the second-order homogeneous recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with initial conditions $a_0 = 2, a_1 = 7$,
 (a) Find the next three terms of the sequence.
 (b) Find the general solution.
 (c) Find the unique solution with the given initial conditions. 8M
- b) Find the generating function for $a_r =$ the number of non-negative integral solutions of $e_1 + e_2 + e_3 + e_4 + e_5 = r$ where $0 \leq e_1 \leq 3, 0 \leq e_2 \leq 3, 2 \leq e_3 \leq 6, 2 \leq e_4 \leq 6, e_5$ is odd and $1 \leq e_5 \leq 9$. 4M
8. a) (i) Give an example for a bipartite graph with examples
 (ii) Find the chromatic numbers of
 I) a bipartite graph $K_{3,3}$
 II) a complete graph K_n and 6M
- b) Find the Minimum spanning tree for the graph given in the following table using Prim's Algorithm?

Weight	7	10	10	11	12	12	13	13	13	15
Edges	(a, b)	(a, d)	(b, d)	(b, c)	(a, e)	(c, e)	(b, c)	(c, d)	(d, e)	(a, c)

6M

M.C.A. I Semester Supplementary Examinations, July/August 2014

Probability & Statistics

Time: 3 hours

Max Marks: 60

Answer any FIVE of the following
All questions carry equal marks (12 Marks each)

* * * * *

1. a) If
- A
- ,
- B
- and
- C
- are three events, then prove that

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C).$$

4M

- b) Determine the probability of the following event :

A non-defective bolt will be found if out of 600 bolts already examined, 12 were defective.

4M

- c) Suppose colored balls are distributed in three indistinguishable boxes as follows :

	Box I	Box II	Box III
Red	2	4	3
White	3	1	4
Blue	5	3	3
Total	10	8	10

A box is selected at random from which a ball is selected at random. What is the probability that the ball is red?

4M

2. a) A discrete random variable
- X
- has the following probability distribution

Value of X	1	2	3	4	5	6	7	8
$P(X = x)$	$2k$	$4k$	$6k$	$8k$	$10k$	$12k$	$14k$	$4k$

(b) Find the value of ' k '. (ii) Find $P(X < 3)$ and $P(X \geq 5)$

(iii) Find the distribution function of X .

6M

- b) Find the value of
- k
- and the distribution function
- $F(x)$
- given the probability density function of a random variable
- X
- as:

$$f(x) = \frac{k}{x^2 + 1}, \quad -\infty < x < \infty.$$

6M

3. a) Find the mean and variance of the Poisson distribution.

6M

- b) A sample of 100 dry battery cells tested to find the length of life 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) Less than 6 hours
(iii) Between 10 and 15 hours?

6M

4. a) Let U_1 be a variable that stands for any of the elements of the population 3, 7, 8 and U_2 be a variable that stands for any of the elements of the population 2, 4. Compute:
 (a) μ_{U_1} (b) μ_{U_2} (c) $\mu_{U_1+U_2}$ (d) $\mu_{U_1-U_2}$ (e) σ_{U_1} (f) σ_{U_2} (g) $\sigma_{U_1+U_2}$ (h) $\sigma_{U_1-U_2}$.
 Verify that (i) $\mu_{U_1 \pm U_2} = \mu_{U_1} \pm \mu_{U_2}$

$$(j) \sigma_{U_1 \pm U_2} = \sqrt{\sigma_{U_1}^2 + \sigma_{U_2}^2}.$$

8M

- b) The contents of 7 similar containers of sulfuric acid are 9.8, 10.2, 10.4, 9.8, 10.0, 10.2, and 9.6 litres. Find a 95% confidence interval for the mean of all such containers, assuming an approximate normal distribution. 4M
5. a) A test of the breaking strengths of 6 ropes manufactured by a company showed a mean breaking strength of 7750 lb and a strength deviation of 145 lb, whereas the manufacturer claimed a mean breaking strength of 8000 lb. Can we support the manufacturer's claim at a level of significance of 0.05? 6M
- b) Fit a Poisson distribution to the following data and test for its goodness of fit at level of significance 0.05.

x	0	1	2	3	4	5
f	275	138	75	7	4	1

6M

6. a) Explain briefly the following
- Null Hypothesis,
 - Alternative hypothesis
 - Type I error
 - Type II error
- b) Two random samples of sizes 1000 and 2000 of farms gave an average yield of 2000 kg and 2050 kg respectively. The variance of wheat farms in the country may be taken as 100 kg. Examine whether the two samples differ significantly in yield. Use a 0.05 level of significance. 6M

7. a) Fit a polynomial of the second degree to the form $y = a + bx + cx^2$ to the following data by the method of least squares:

x	0	1	2	3	4
y	1	0	3	10	21

5M

- b) The following table gives the ages and blood Pressure of 10 women :

Age(X)	56	42	36	47	49	42	60	72	63	55
Blood Pressure(Y)	147	125	118	128	145	140	155	160	149	150

- Determine the correlation coefficient between X and Y.
- Determine the regression equation of Y on X.
- Estimate the blood Pressure of a women whose age is 45 years.

7M

8. a) Explain briefly the main characteristics of Queuing system? 5M
- b) A toll gate is operated on a freeway where cars arrive according to a Poisson distribution with mean frequency of 1.2 cars per minute. The time of completing payment follows an exponential distribution with mean of 20 seconds.

Find

- (i) The idle time of the counter
- (ii) Average number of cars in the system
- (iii) Average number of cars in the queue
- (iv) Average time that a car spends in the system
- (v) Average time that a car spends in the queue.

7M

Code : 1P2B12

M.C.A. I Semester Supplementary Examinations, July/August 2014
Computer Programming

Time: 3 hours

Max Marks: 60

Answer any FIVE of the following
All questions carry equal marks (12 Marks each)

1. a) Distinguish between the 3gl and 4gls 6M
b) What is an Algorithm? Write an algorithm to find the roots of a quadratic equation considering all cases. 6M
2. a) What is meant by operator precedence? What are the relative precedence of the arithmetic operators? What is the associativity of the arithmetic operators? How can the value of an expression be converted to a different data types? What is this called? 6M
b) Character strings in C are automatically terminated by NULL character. Explain how this feature helps in string manipulations. 6M
3. a) Define user-defined function. Give the general format of declaring a function. Compare local and global variables. 6M
b) Define the following and give an example for each:
i) Pointer
ii) pointer to pointer
iii) array of pointers 6M
4. a) Define a structure that can describe a hotel. It should have members that include the name, address, grade, average room charge, and number of rooms. Write a C program to perform following operations:
(i) To print out hotels of a given grade in order of charges.
(ii) To print out hotels with room charges less than a given value. 6M
b) Explain the command line arguments. What are the syntactic constructs followed in C. 6M
5. a) How are the argument data types specified for a C++ function? Explain with Suitable example. 6M
b) Write a C++ program to illustrate the use of pointers to objects. 6M
6. a) What is friend function? List out its advantages over a normal function. 6M
b) Write a C++ program, to find the factorial of a number using a constructor and a destructor. 6M
7. a) What do you mean by dynamic binding? How it is useful in OOP? 4
b) Write a C++ program to implement function overloading? 8
8. a) Describe briefly the features of I/O system supported by C++. 6M
b) Give a detailed description of the concepts of exception handling with specific reference to the concepts of rethrowing an exception, exception specification etc. 6M
