Roll No:

Application No:

Name:

Exam Date: **06-Oct-2020**

Exam Time: **09:00-12:00**

Examination: **1. Course Code - Ph.D.**
2. Field of Study - Computer & Systems Sciences (SCSH)

SECTION 1 - SECTION 1

Question No.1 (Question Id - 63)

Consider two languages over {a, b} :

$L_1 = \{a^n b^m | n \geq 1, m \geq 0\} \cup \{ba\}$

$L_2 = \{b^m | m \geq 1\}$

Then L_1/L_2 is :

(A) ◯ $\{a^n | n \geq 1\}$

(B) ◯ **$\{a^n b^m | n \geq 1, m \geq 0\}$ (Correct Answer)**

(C) ◯ $\{a^n b^m | n \geq 1, m \geq 1\}$

(D) ◯ $\{a^n | n \geq 1\} \cup \{ba\}$

Question No.2 (Question Id - 54)

Consider the following transactions involving two bank accounts x and y.

read (x); x := x - 50; write (x);   read (y); y := y + 50; write (y)

The constraint that the sum of the accounts x and y should remain constant is that of

(A) ◯ Atomicity

(B) ◯ **Consistency (Correct Answer)**

(C) ◯ Isolation

(D) ◯ Durability

Question No.3 (Question Id - 59)

The below question has been dropped and full marks are awarded.

Which of the following is **not true** related to binary floating point representation in IEEE-754 format ?

(A) ◯ 1 bit for sign, 11 bits for exponent, 52 bits for fraction

(B) ◯ 12 bits for biased exponent, 52 bits for fraction

(C) ◯ 1 bit for sign, 11 bits for biased exponent, 52 bits for fraction

(D) ◯ 1 bit for sign, (10 + 1 bit sign) bits for exponent, 52 bits for fraction

Question No.4 (Question Id - 71)

Consider the following five relations defined on the set A = {1, 2, 3} :

Ø = Empty relation

R = {(1, 1), (1, 2), (1, 3), (3, 3)}

S = {(1, 1)(1, 2), (2, 1), (2, 2), (3, 3)}

T = {(1, 1), (1, 2), (2, 2), (2, 3)}

A x A = universal relation

Which of the above relations has reflexive property ?

(A) ◯ Only R and S

(B) ◯ **Only S and A x A (Correct Answer)**

(C) ◯ Only R and T

(D) ◯ Only S and T

Question No.5 (Question Id - 20)

Non-overlapping categories or intervals are known as :

(A) ◯ Inclusive
(B) ◯ Exhaustive
(C) ◯ **Mutually exclusive (Correct Answer)**
(D) ◯ Mutually exclusive and exhaustive

Question No.6 (Question Id - 30)

Consider the following two statements about Partial correlation :

S1. It measures separately the relationship between two variables in such a way that the effects of other related variables are eliminated.

S2. It measures the relation between a dependent variable and a particular independent variable by holding all other variables constant.

Which of the following is **not** related to Partial correlation ?

(A) ◯ Only S1 is true
(B) ◯ Only S2 is true
(C) ◯ **Both S1 and S2 are true (Correct Answer)**
(D) ◯ Neither S1 nor S2 is true

Question No.7 (Question Id - 28)

Which of the following is true Systematic bias in sampling analysis ?

(A) ◯ Defective measuring device
(B) ◯ Indeterminacy principle
(C) ◯ Inappropriate sampling frame
(D) ◯ **All of the above (Correct Answer)**

Question No.8 (Question Id - 7)

The below question has been dropped and full marks are awarded.

Which of the factor should **not** be considered for a good research design ?

(A) ◯ The means of obtaining information.
(B) ◯ The availability and skills of the researcher and his staff.
(C) ◯ The nature of the problem to be studied.
(D) ◯ All of the above.

Question No.9 (Question Id - 36)

If the probability of an event E in a given experiment is p and the experiment is repeated n times, then the probability that E occurs k times in any order, for very large n, $npq >> 1$, $(p + q = 1)$ and $|k - np|$ is of order $\sqrt{npq}$, is approximated by :

(A) ◯ $\dfrac{1}{\sqrt{2\pi npq}} e^{\frac{-(k-np)^2}{2\pi npq}}$

(B) ◯ $\dfrac{1}{\sqrt{2\pi npq}} e^{\frac{-(k-np)^2}{2pq}}$

(C) ◯ $\boxed{\dfrac{1}{\sqrt{2\pi npq}}}$ **(Correct Answer)**

(D) ◯ $\dfrac{1}{\sqrt{2\pi pq}} e^{\frac{-(k-np)^2}{2pq}}$

Question No.10 (Question Id - 31)

Probability cannot be defined by :
(A) ○ Axiomatically
(B) ○ Relative frequency
(C) ○ **Non-Inductive reasoning (Correct Answer)**
(D) ○ A ratio of favorable to total numbers of alternative

Question No.11 (Question Id - 4)

Consider the following statements in reference to the steps of a technique involved in defining a research problem :

S1. Statement of the problem in a general way and understanding the nature of the problem.

S2. Surveying the available literature and developing the ideas through discussions.

S3. Rephrasing the research problem into a non-working proposition.

Which of the following holds true ?

(A) ○ Only S1 true
(B) ○ Only S2 true
(C) ○ **Only S3 false (Correct Answer)**
(D) ○ All S1, S2 and S3 are true

Question No.12 (Question Id - 12)

Which of the following is **not true** for the Chi-Square test ?

(A) ○ **It is parametric (Correct Answer)**
(B) ○ It tests a hypothesis
(C) ○ **It is useful for estimation (Correct Answer)**
(D) ○ It can be applied to a complex contingency table with several classes

Question No.13 (Question Id - 93)

The index of a subgroup H of the group G is :
(A) ○ **O(G)/O(H) (Correct Answer)**
(B) ○ O(H)/O(G)
(C) ○ O(G).O(H)
(D) ○ O(G) - O(H)

Question No.14 (Question Id - 14)

Mean, Median and Mode are :
(A) ○ Measures of deviation
(B) ○ Ways of sampling
(C) ○ **Measures of central tendency (Correct Answer)**
(D) ○ None of the above

Question No.15 (Question Id - 81)

Consider the followings :

A. Completeness	I. How long does it take to find a solution.
B. Time Complexity	II. How much memory needs to perform the search.
C. Space Complexity	III. Is the guaranteed to find the solution.

Which is correct matching ?

(A) ○ A - III, B - II, C - I
(B) ○ A - I, B - II, C - III
(C) ○ **A - III, B - I, C - II (Correct Answer)**

(D) ○ A - I, B - III, C - II

Question No.16 (Question Id - 45)
A family has two children. The conditional probability that both are boys, given that at least one of them is a boy, is :

(A) ○ 1/2
(B) ○ **1/3 (Correct Answer)**
(C) ○ 1/4
(D) ○ 3/4

Question No.17 (Question Id - 17)
How is the stochastic equation of information solved ?
(A) ○ By statistical rules
(B) ○ By dynamic rules
(C) ○ **By statistical and dynamic rules (Correct Answer)**
(D) ○ None of these

Question No.18 (Question Id - 23)
Motivation Research is a kind of :
(A) ○ **Qualitative Research (Correct Answer)**
(B) ○ Fundamental Research
(C) ○ Conceptual Research
(D) ○ Quantitative Research

Question No.19 (Question Id - 82)
A binary search tree whose left and right subtrees differ in height by at most 1 is called :

(A) ○ **AVL tree (Correct Answer)**
(B) ○ Red-Black tree
(C) ○ Lemma tree
(D) ○ None of the above

Question No.20 (Question Id - 24)
Consider the following statements for the criteria of good research :

 S1. The analysis of data should be sufficiently adequate to reveal its significance and the methods of analysis used should be appropriate.

 S2. Conclusions should not be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.

 Which of the following is true ?

(A) ○ **Only S1 true (Correct Answer)**
(B) ○ Only S2 true
(C) ○ Both S1 and S2 true
(D) ○ Both S1 and S2 false

Question No.21 (Question Id - 94)
If $T:V_3 \rightarrow V_4$ is defined as $T(x_1, x_2, x_3) = (x_1, x_1+x_2, x_3, x_1+x_3)$ and $S:V_4 \rightarrow V_2$ is defined as $S(x_1, x_2, x_3, x_4) = (x_1+x_2 , x_3+x_4)$ then ST (x_1, x_2, x_3) is :

(A) ○ (x_1+2x_2, x_3+x_2, x_3)
(B) ○ **$(2x_1+x_2, x_1+2x_3)$ (Correct Answer)**
(C) ○ (x_1+2x_2, x_2+2x_3)
(D) ○ $(x_2+2x_3, 2x_1+2x_2)$

Question No.22 (Question Id - 99)
For the iterative methods to solve a system of linear equations, which of the following is true ?

(A) ○ Gauss - Seidel method is also known as the method of simultaneous displacements
(B) ○ Jacobi method is also known as the method of successive displacement
(C) ○ **Jacobi method is known as the method of simultaneous displacements and Gauss - Seidel method is known as method of successive displacement. (Correct Answer)**
(D) ○ None of the above

Question No.23 (Question Id - 68)
In a survey of 120 people reading three magazines, it was found that 65 people read Outlook, 20 read both Outlook and Observer, 45 read Observer, 25 read both Outlook and Chronicle, 42 read Chronicle, 15 read both Observer and Chronicle, 8 read all three magazines. The number of people who read at least one of the three magazines is :

(A) ○ **100 (Correct Answer)**
(B) ○ 82
(C) ○ 150
(D) ○ 33

Question No.24 (Question Id - 64)
Which is **not true** about operating system ?
(A) ○ It is intermediary between the users of computer and the computer hardware
(B) ○ It provides an environment in which a user can easily interface with computer to execute programs
(C) ○ **It is an algorithm that manages the hardware (Correct Answer)**
(D) ○ It helps to increase efficiency

Question No.25 (Question Id - 46)
Suppose that the joint probability mass function p (x, y) of random variables X and Y is given by p (1, 1) = 0.5, p (1, 2) = 0.1, p (2, 1) = 0.1, p (2, 2) = 0.3. The conditional probability mass function of X given that Y = 1 is :

(A) ○ 2/6
(B) ○ **5/6 (Correct Answer)**
(C) ○ 1/6
(D) ○ 3/6

Question No.26 (Question Id - 73)
For the X.25 networks, which of the following is **not true** ?
(A) ○ They are connection oriented
(B) ○ The data size is of maximum size 128 bytes
(C) ○ The header size is of 3 bytes
(D) ○ **The connection number is of 10 bits (Correct Answer)**

Question No.27 (Question Id - 6)
Which is **not** a part of research design ?
(A) ○ Sampling design
(B) ○ Operational design
(C) ○ Observational design
(D) ○ **Non-statistical design (Correct Answer)**

Question No.28 (Question Id - 15)
Which of the following is **not** Graphic representation ?
(A) ○ Pie Chart
(B) ○ Bar Chart
(C) ○ **Table (Correct Answer)**
(D) ○ Histogram

Question No.29 (Question Id - 25)

Which of the following is optional for research design ?

(A) ○ A clear statement of the research problem

(B) ○ Procedures and techniques to be used for gathering information

(C) ○ Population to be studied

(D) ○ **None of the above (Correct Answer)**

Question No.30 (Question Id - 89)

The function $f(x) = \frac{2x^2 - 8}{x^2 - 16}$:

(A) ○ **Concave up to the left of $x = -4$, is concave down between $x = -4$ and $x = 4$, and is concave up to the right of $x = 4$.**

(Correct Answer)

(B) ○ Concave down to the left of $x = -4$, is concave up between $x = -4$ and $x = 4$, and is concave down to the right of $x = 4$.

(C) ○ Has one inflection point

(D) ○ Has two infection points

Question No.31 (Question Id - 95)

If T is a linear transformation and n is a positive integer, then T is :

(A) ○ Nilpotent if $T^2 = T$ and idempotent if $T^n = 0$

(B) ○ **Idempotent if $T^2 = T$ and nilpotent if $T^n = 0$ (Correct Answer)**

(C) ○ Idempotent if $T^2 = T$ and nilpotent if $T^n = T$

(D) ○ Nilpotent if $T^2 = T$ and idempotent if $T^n = T$

Question No.32 (Question Id - 55)

What are the min and max number of tables required to convert an ER diagram with 2 entities and 1 relationship between them, with partial participation constraints of both entities ?

(A) ○ Min 1 and max 2

(B) ○ Min 1 and max 3

(C) ○ **Min 2 and max 3 (Correct Answer)**

(D) ○ Min 2 and max 2

Question No.33 (Question Id - 84)

Consider the following program :

```
#include <stdio.h>
void main()
{
    float a=0.7;
    if (a<0.7)
        printf("C");
    else
        printf("C++");
}
```

The output of the above program is :

(A) ○ **C (Correct Answer)**

(B) ○ C++

(C) ○ Compiler error a float cannot be compared with a double.

(D) ○ None of the above

Question No.34 (Question Id - 49)

Let X be a uniformly distributed random variable over (0, 1). Then the expected value of X^3 is :

(A) ○ **1/4 (Correct Answer)**

(B) ◯ 1/3
(C) ◯ 1/2
(D) ◯ 1

Question No.35 (Question Id - 5)

Which of the following is **not true** ?

Complex random sampling design is based on

(A) ◯ Systematic sampling
(B) ◯ Stratified sampling
(C) ◯ Area sampling
(D) ◯ **Judgment sampling (Correct Answer)**

Question No.36 (Question Id - 86)

Consider the following program :

```
#include<stdio.h>
int fun();
int i;
void main()
{
   while (i)
   {
        fun();
        main();
   }
printf (" hello" );
}
fun()
{
   printf("Hi");
}
```

The output of the above program is :

(A) ◯ **Hello (Correct Answer)**
(B) ◯ Hi Hello
(C) ◯ No output
(D) ◯ Infinite

Question No.37 (Question Id - 72)

The syntax and semantic of the information to be transmitted using OSI model is related to :

(A) ◯ Physical layer
(B) ◯ Network layer
(C) ◯ Transport layer
(D) ◯ **Presentation layer (Correct Answer)**

Question No.38 (Question Id - 65)

Which is **not true** about multiprogramming ?

(A) ◯ **It refers to program in multiple languages (Correct Answer)**
(B) ◯ Multiple jobs can be kept in memory at the same time
(C) ◯ It allows timesharing
(D) ◯ Multiple users can use computer system at the same time interactively

Question No.39 (Question Id - 33)

Train X arrives at the station at random in the time interval (0,T), stopping for a minutes; train Y arrives independently in the same interval, stopping for b minutes. The probability that X will arrive before Y is :

(A) ◯ 1/3
(B) ◯ **1/2 (Correct Answer)**
(C) ◯ 1

(D) ○ 0

Question No.40 (Question Id - 26)

Consider the following statements for qualities of a good research :

S1. It should be systematic but may not be logical.

S2. It should be empirical but may not be replicable.

Which of the following is true ?

(A) ○ Only S1 is true
(B) ○ Only S2 is true
(C) ○ Both S1 and S2 are true
(D) ○ **Both S1 and S2 are false (Correct Answer)**

Question No.41 (Question Id - 53)

Consider the relational scheme with attributes V, W, X, Y, Z that has primary key V Y. Which of the following is **not** a superkey ?

(A) ○ V X Y Z
(B) ○ **V W X Z (Correct Answer)**
(C) ○ V W X Y
(D) ○ V W X Y Z

Question No.42 (Question Id - 66)

Consider the following two statements about cache memory :

S1. Cache coherency is generally related to multiprocessor environment.

S2. Cache consistency is usually related to distributed environment.

Which of the following is true ?

(A) ○ Only S1 is true
(B) ○ Only S2 is true
(C) ○ **Both S1 and S2 are true (Correct Answer)**
(D) ○ Both S1 and S2 are false

Question No.43 (Question Id - 98)

The order of convergence of Newton - Raphson method is :
(A) ○ 1.0
(B) ○ 1.5
(C) ○ 1.6
(D) ○ **2.0 (Correct Answer)**

Question No.44 (Question Id - 39)

Let X be an arbitrary random variable with probability density function
$f(x)$ and finite variance σ^2. The probability $P\{E\{X\} - \varepsilon < X < E\{X\} + \varepsilon\}$,
$\varepsilon > 0$, irrespective of the shape of $f(x)$, is :

(A) ○ $\geq \dfrac{\sigma^2}{\varepsilon^2}$

(B) ○ $\geq 1 - \dfrac{\sigma^2}{\varepsilon^2}$ **(Correct Answer)**

(C) ○ $\leq 1 - \dfrac{\sigma^2}{\varepsilon^2}$

(D) ○ $\leq \dfrac{\sigma^2}{\varepsilon^2}$

Question No.45 (Question Id - 96)

If $T:V_3 \rightarrow V_2$ is defined as $T(x_1, x_2, x_3) = (x_1 - x_2, x_2 + x_3)$, then the Null space of T, N(T) is given by :

(A) ○ [(1, -1, -1)]

(B) ○ [(-1, 1, 1)]

(C) ○ [(1,-1, 1)]

(D) ○ **[(1, 1, -1)] (Correct Answer)**

Question No.46 (Question Id - 40)

A box has 10 white and 5 red balls; a second bag has 20 white and 20 red balls. One bag is randomly selected and from this bag, a ball is randomly picked. The probability that the picked ball is white is :

(A) ○ **7/12 (Correct Answer)**

(B) ○ 5/12

(C) ○ 6/11

(D) ○ 5/11

Question No.47 (Question Id - 100)

Suppose f(x) is continuous on some interval [a, b] and f(a)f(b) < 0. Consider the following statements :

S1. The equation f(x) = 0 has at least one real root in the interval (a, b).

S2. The equation f(x) = 0 has odd number of roots in the interval (a, b).

Which of the following is true ?

(A) ○ S1 only

(B) ○ S2 only

(C) ○ **Both S1 and S2 (Correct Answer)**

(D) ○ Neither S1 nor S2

Question No.48 (Question Id - 41)

In a fair dice experiment, a random variable X is defined by
$X(f_i) = 10i$, f_i, $i = 1, 2,...6$, is i^{th} face of dice.
Let F denote the distribution function of X, then the value of F (100) is :

(A) ○ 0

(B) ○ 1/2

(C) ○ 1/3

(D) ○ **1 (Correct Answer)**

Question No.49 (Question Id - 92)

If a group G is of prime order, then the group G has :

(A) ○ Infinite numbers of subgroups

(B) ○ Finitely many subgroups

(C) ○ **Only two subgroups (Correct Answer)**

(D) ○ Only one subgroup

Question No.50 (Question Id - 19)

Which of the following represents the fiftieth percentile in a set of numbers arranged in order of magnitude ?

(A) ○ Mode

(B) ○ **Median (Correct Answer)**

(C) ○ Mean

(D) ○ Variance

Question No.51 (Question Id - 38)

If X is uniformly distributed in the interval $(-c, c)$, then the expected value of X^{2n}, n is a positive integer, is :

(A) ○ $\dfrac{c}{2n+1}$

(B) ○ $\dfrac{c^n}{2n+1}$

(C) ○ $\boxed{\dfrac{c^{2n}}{2n+1}}$ **(Correct Answer)**

(D) ○ $\dfrac{c^{2n+1}}{2n+1}$

Question No.52 (Question Id - 44)

Four fair coins are flipped if the outcome are assumed independent, then the probability of getting two heads and two tails is :

(A) ○   1/8

(B) ○   **3/8 (Correct Answer)**

(C) ○   5/8

(D) ○   7/8

Question No.53 (Question Id - 8)

Which one is **not** important concept related to the research design ?

(A) ○   Dependent and independent variables

(B) ○   Extraneous variable

(C) ○   Research hypothesis

(D) ○   **Non-confounded relationship (Correct Answer)**

Question No.54 (Question Id - 47)

Suppose the joint density function of random variables X and Y is given by

$$f(x,y) = \begin{cases} 6xy(2-x-y), & 0<x, y<1 \\ 0, & \text{Otherwise} \end{cases}$$

Then the conditional expectation of X given that Y = y, where $0 < y < 1$, is :

(A) ○ $\boxed{\dfrac{5-4y}{8-6y}}$ **(Correct Answer)**

(B) ○ $\dfrac{3-4y}{5-6y}$

(C) ○ $\dfrac{3-5y}{6-8y}$

(D) ○   None of these

Question No.55 (Question Id - 37)

A coin with probability of getting head as p is tossed n times. The probability getting k heads is :

(A) ○ $\boxed{\dbinom{n}{k}(p)^k(1-p)^{n-k}}$ **(Correct Answer)**

(B) ○ $\dbinom{n}{k}(p)^n(1-p)^{n-k}$

(C) ○ $\dbinom{n}{k}(p)^{n-k}(1-p)^k$

(D) ○

$$\binom{n}{k}(p)^{n-k}(1-p)^n$$

Question No.56 (Question Id - 56)
Which of the following is **not** related to the internal memory ?
(A) ○ Word
(B) ○ Addressable unit
(C) ○ Unit of transfer
(D) ○ **I/O controller (Correct Answer)**

Question No.57 (Question Id - 27)
Which of the following is **not** factor analysis method ?
(A) ○ Centroid method
(B) ○ Principal components method
(C) ○ Maximum likelihood method
(D) ○ **None of the above (Correct Answer)**

Question No.58 (Question Id - 9)
Which of the following is **not true** for research design in case of exploratory research studies ?

(A) ○ **Rigid design (Correct Answer)**
(B) ○ Non-probability sampling design
(C) ○ No fixed decisions about the operational procedures
(D) ○ No pre-planned design for analysis

Question No.59 (Question Id - 70)
The relation $\subseteq$ of set inclusion is **not** an equivalence relation. Which of the following is true ?

(A) ○ **It is reflexive and transitive, but not symmetric (Correct Answer)**
(B) ○ It is reflexive and symmetric, but not transitive
(C) ○ It is transitive and symmetric, but not reflexive
(D) ○ None of these

Question No.60 (Question Id - 76)
The height of a B-Tree of degree t is :
(A) ○ $\log_t\left(\dfrac{n+1}{2}\right)$ **(Correct Answer)**

(B) ○ $\log_t\left(\dfrac{n-1}{2}\right)$

(C) ○ $\log_t (n + 1)$
(D) ○ $\log_t (n - 1)$

Question No.61 (Question Id - 18)
If a distribution is skewed to the left, then it is :
(A) ○ **Negatively skewed (Correct Answer)**
(B) ○ Positively skewed
(C) ○ Symmetrically skewed
(D) ○ Symmetrical

Question No.62 (Question Id - 32)
Consider the following two statements.

S1. The outcome of one experiment is deterministic.

S2. Certain average of a large number of experiments is probabilistic.

Which of the following is true ?

(A) ○ **S1 and S2 both are true (Correct Answer)**
(B) ○ S1 is true and S2 is false
(C) ○ S1 is false and S2 is true
(D) ○ Both S1 and S2 are false

Question No.63 (Question Id - 13)

Consider the following statements for Chi-Square test :

S1. It is based on frequencies and not on the parameters like mean and standard deviation.

S2. It does not need rigid assumptions in regard to the type of population.

Which of the following is true ?

(A) ○ Only S1 true
(B) ○ Only S2 true
(C) ○ **Both S1 and S2 true (Correct Answer)**
(D) ○ None of the above

Question No.64 (Question Id - 35)

Suppose a discrete random variable X takes values at the points

0, 1....n,..., with probability $P\{X=k\}=e^{-a}\dfrac{a^k}{k!}, k=0,1,...., a \geq 0,$ $\left(\delta(x)=\begin{cases}1, x=0\\0, x\neq 0\end{cases}\right)$

Then its probability density function $f(x)$ is :

(A) ○ $f(x) = e^{-a}\sum_{k=0}^{\infty}\dfrac{a^k}{k!}x^k$

(B) ○ $f(x) = e^{-ax}\sum_{k=0}^{\infty}\dfrac{(ax)^k}{k!}\delta(x-k)$

(C) ○ $f(x) = e^{-ax}\sum_{k=0}^{\infty}\dfrac{(ax)^k}{k!}$

(D) ○ $\boxed{f(x) = e^{-a}\sum_{k=0}^{\infty}\dfrac{a^k}{k!}\delta(x-k)}$ **(Correct Answer)**

Question No.65 (Question Id - 58)

Which of the following is **not** related to PSW ?
(A) ○ Sign
(B) ○ Zero
(C) ○ **Process control block (Correct Answer)**
(D) ○ Supervisor mode

Question No.66 (Question Id - 67)

Consider the following three statements about the bootstrap program :

S1. It initializes CPU registers, device controllers, and memory contents.

S2. It locates operating system and loads it into memory.

S3. It executes init process.

Which of the following is true ?

(A) ○ Only S1 is false
(B) ○ Only S2 is false
(C) ○ **Only S3 is false (Correct Answer)**
(D) ○ All are false

Question No.67 (Question Id - 80)

Consider the following statements regarding stack :

S1. It is data structure used in backtracking.

S2. It is data structure used in memory management.

S3. It is data structure used in expression evaluation.

Which of the following is true ?

(A) ○ Only S1 is true
(B) ○ Only S2 is true
(C) ○ Only S3 is true
(D) ○ **All S1, S2 and S3 are true (Correct Answer)**

Question No.68 (Question Id - 90)

If $F(x)$ is an antiderivative of $f(x)$ and $G(x)$ is an antiderivative of $g(x)$, then $\int_a^b f(x)\,dx = \int_a^b g(x)\,dx$, if and only if :

(A) ○ G(a) - F(b) = F(a) - G(b)
(B) ○ **G(a) + F(b) = F(a) + G(b) (Correct Answer)**
(C) ○ G(a)/G(b) = F(a)/F(b)
(D) ○ G(a)/F(b) = F(a)/G(b)

Question No.69 (Question Id - 34)
Let n points be placed randomly in the interval (0,T). The probability that k of these points lie in the interval (t_1, t_2) is :

(A) ○ $\binom{n}{k}\left(\dfrac{t_2 - t_1}{T}\right)^k \left(1 - \dfrac{t_2 - t_1}{T}\right)^{n-k}$ **(Correct Answer)**

(B) ○ $\binom{n}{k}\left(\dfrac{t_2 - t_1}{T}\right)^n \left(1 - \dfrac{t_2 - t_1}{T}\right)^{n-k}$

(C) ○ $\binom{n}{k}\left(\dfrac{t_2 - t_1}{T}\right)^{n-k} \left(1 - \dfrac{t_2 - t_1}{T}\right)^k$

(D) ○ $\binom{n}{k}\left(\dfrac{t_2 - t_1}{T}\right)^{n-k} \left(1 - \dfrac{t_2 - t_1}{T}\right)^n$

Question No.70 (Question Id - 2)
Which of the following is **not true** for a scientific method ?
(A) ○ **It relies on oral evidence (Correct Answer)**
(B) ○ It utilizes relevant concepts
(C) ○ It is committed to only objective considerations
(D) ○ It results into probabilistic predictions

Question No.71 (Question Id - 97)
If $T:V_3 \rightarrow V_3$ is defined as $T(x_1, x_2, x_3) = (x_1 - x_2, 2x_2, x_1 + x_3)$, then $T^{-1}(x_1, x_2, x_3)$ is :

(A) ○ $\left(x_1 + \dfrac{x_2}{2}, \dfrac{x_2}{2}, x_3 + x_1 + \dfrac{x_2}{2}\right)$

(B) ○ $\left(x_1 - \dfrac{x_2}{2}, \dfrac{x_2}{2}, x_3 - x_1 - \dfrac{x_2}{2}\right)$

(C) ○ $\left(x_1 + \dfrac{x_2}{2}, \dfrac{x_1 + x_2}{2}, x_3 - x_1 - \dfrac{x_2}{2}\right)$

(D) ○ $\left(x_1 + \dfrac{x_2}{2}, \dfrac{x_2}{2}, x_3 - x_1 - \dfrac{x_2}{2}\right)$ **(Correct Answer)**

Question No.72 (Question Id - 74)

Which of the following is **not** switching type ?
(A) ○ Circuit switching
(B) ○ **Data switching (Correct Answer)**
(C) ○ Packet switching
(D) ○ Message switching

Question No.73 (Question Id - 88)
An absolute extremum of a function $f(x)$ must occur at a point where

(A) ○ $f'(x)$ is finite
(B) ○ $f'(x)$ is infinite
(C) ○ $f(x)$ has a point of inflection
(D) ○ **$f(x)$ has a critical point (Correct Answer)**

Question No.74 (Question Id - 1)
Consider the following statements :

S1. To portray accurately the characteristics of a particular individual, situation or a group are known as *descriptive* research studies.

S2. To determine the frequency with which something occurs or with which it is associated with something else are known as diagnostic research studies.

S3. To test a hypothesis of a causal relationship between the variables are known as *hypothesis-testing* research studies.

 Which of the following is true ?

(A) ○ Only S1 is true
(B) ○ S1 is true and S2 is false
(C) ○ S1 is false and S2 is true
(D) ○ **All S1, S2 and S3 are true (Correct Answer)**

Question No.75 (Question Id - 77)

Consider the following statements :

S1. Kruskal algorithm is based on greedy approach.

S2. Second smallest of n elements can be found with $n + \lceil \log n \rceil - 2$ comparison in worst case.

Which of the following is true ?

(A) ○ Only S1 true
(B) ○ Only S2 true
(C) ○ Both S1 and S2 false
(D) ○ **S1 and S2 both are true (Correct Answer)**

Question No.76 (Question Id - 3)
Which of the following is **not** a characteristic of good research ?

(A) ○ It is systematic
(B) ○ It is logical
(C) ○ It is empirical
(D) ○ **It is not replicable (Correct Answer)**

Question No.77 (Question Id - 50)
Let X denote the outcome when a fair dice is rolled. Then the expected value of X^2 is :

(A) ○ 31/6

(B) ○ 37/6

(C) ○ 41/6

(D) ○ **91/6 (Correct Answer)**

Question No.78 (Question Id - 75)

The HDLC protocol is used at :

(A) ○ **Data link layer (Correct Answer)**

(B) ○ Network layer

(C) ○ Transport layer

(D) ○ Application layer

Question No.79 (Question Id - 43)

Consider that a certain letter is equally likely to be in any one of three different folders. Let α_i, $(\alpha_i < 1)$ be the probability that you will find your letter making a quick examination of folder i if the letter is in fact in folder i, $(i = 1, 2, 3)$. Suppose you look in folder 1 and do not find the letter. Then the probability that the letter is in folder 1 is :

(A) ○ $\dfrac{1 - \alpha_1}{3}$

(B) ○ $\boxed{\dfrac{1 - \alpha_1}{3 - \alpha_1}}$ **(Correct Answer)**

(C) ○ $1 - (\alpha_2 + \alpha_3)$

(D) ○ $1 - (\alpha_1 + \alpha_2 + \alpha_3)$

Question No.80 (Question Id - 42)

Let X be a random variable uniformly distributed between 900 and 1100. Then the probability density function $f_Y(y)$ of Y ($Y = 1/X$) is :

(A) ○ $\boxed{f_Y(y) = \dfrac{1}{200y^2} , \text{for } \dfrac{1}{1100} < y < \dfrac{1}{900}}$ **(Correct Answer)**

(B) ○ $f_Y(y) = \dfrac{1}{200y} , \text{for } \dfrac{1}{1100} < y < \dfrac{1}{900}$

(C) ○ $f_Y(y) = \dfrac{1}{200y^3} , \text{for } \dfrac{1}{1100} < y < \dfrac{1}{900}$

(D) ○ $f_Y(y) = \dfrac{1}{200} , \text{for } \dfrac{1}{1100} < y < \dfrac{1}{900}$

Question No.81 (Question Id - 22)

In a study, subjects are randomly assigned to one of three groups: control, experimental A, experimental B. After treatment, the mean scores for the three groups are compared. The appropriate statistical test for comparing these means is :

(A) ○ **Analysis of variance (Correct Answer)**

(B) ○ Correlation coefficient

(C) ○ Chi-square

(D) ○ T-test

Question No.82 (Question Id - 87)

Which of the following statements is correct ?

(A) ○ strcmp (S1, S2) returns a number less than 0 if S1 > S2

(B) ○ strcmp (S1, S2) returns a number greater than 0 if S1 < S2

(C) ○ **strcmp (S1, S2) returns 0 if S1 == S2 (Correct Answer)**

(D) ○ strcmp (S1, S2) returns 1 if S1 == S2

Question No.83 (Question Id - 16)

Which of the following is **not** covered under Intellectual Property Rights ?

(A) ○ Copyrights
(B) ○ Patents
(C) ○ Trade Marks
(D) ○ **Thesaurus (Correct Answer)**

Question No.84 (Question Id - 62)
Let L1 and L2 be two regular languages. Consider the following two statements :

S1. L1 U L2 is non-regular

S2. L1* is regular

Which of the following is true ?

(A) ○ Both S1 and S2 are false
(B) ○ **Only S1 is false (Correct Answer)**
(C) ○ Only S2 is false
(D) ○ Both S1 and S2 are true

Question No.85 (Question Id - 11)
Which of the following is **not** basic principle of experimental design ?

(A) ○ Principle Replication
(B) ○ Principle of Randomization
(C) ○ Principle of Local Control
(D) ○ **None of the above (Correct Answer)**

Question No.86 (Question Id - 21)
Which of the following is **not** a measure of variability ?
(A) ○ **Median (Correct Answer)**
(B) ○ Coefficient of mean deviation
(C) ○ Standard deviation
(D) ○ Range

Question No.87 (Question Id - 85)
Consider the following program :
```
#include <stdio.h>
int fun (int (*)());
int main()
{
   fun (main);
   printf("Hi");
   return 0;
}
fun(int (*p)())
{
   printf("Hello");
   return 0;
}
```
The output of the above program is :
(A) ○ An infinite loop
(B) ○ Hi
(C) ○ **Hello Hi (Correct Answer)**
(D) ○ Error

Question No.88 (Question Id - 60)
Consider the following two statements in reference to finite automata :

S1. It can serve as model for search-and-backtrack algorithm.

S2. It can accept $\{a^3\} \cup \{a^{2n} : n \geq 1\}$.

Which of the following is true ?

(A) ○ **Both S1 and S2 are true (Correct Answer)**
(B) ○ Only S1 is true
(C) ○ Only S2 is true
(D) ○ Both are false

Question No.89 (Question Id - 91)

If G is a group with operation *, and let H be a subgroup of G, then :

(A) ○ **The identity element and inverse of an element a in H are same as the identity element and inverse of a in G, respectively. (Correct Answer)**
(B) ○ The identity elements of H and G are same but the inverse of an element a in H is not the same as inverse of a in G.
(C) ○ The identity element and inverse of an element a in H are not same as the identity element and inverse of a in G, respectively.
(D) ○ The identity elements of H and G are different, whereas the inverse of an element a in H is same as the inverse of a in G.

Question No.90 (Question Id - 78)

Let $f(n)$ and $g(n)$ be asymptotically positive functions. Then, which of the following is true ?

(A) ○ $f(n) = O((f(n))^2)$
(B) ○ $f(n) = \theta(f(n/2))$
(C) ○ $f(n) = O(g(n))$ implies $2^{f(n)} = O(2^{g(n)})$
(D) ○ **$f(n) = O(g(n))$ implies $g(n) = \Omega(f(n))$ (Correct Answer)**

Question No.91 (Question Id - 10)

Which of the following is true for research design in case of descriptive or diagnostic research studies ?

(A) ○ **Advanced decisions about operational procedures (Correct Answer)**
(B) ○ Flexible design
(C) ○ No fixed decisions about the operational procedures
(D) ○ No pre-planned design for analysis

Question No.92 (Question Id - 52)

Consider the following statements :

S1. The tuple relational calculus is a procedural language.

S2. The domain relational calculus is a procedural language.

S3. The basic relational algebra is a procedural language.

Which of the following is true ?

(A) ○ Only S1
(B) ○ Only S2
(C) ○ **Only S3 (Correct Answer)**
(D) ○ All S1, S2 and S3

Question No.93 (Question Id - 79)

The maximum number of elements in a heap of height h is :

(A) ○ 2^{h+2}
(B) ○ **$2^{h+1} - 1$ (Correct Answer)**
(C) ○ 2^{h+1}
(D) ○ 2^h

Question No.94 (Question Id - 61)

Let r1 and r2 be regular expressions and L(r) denote the language corresponding to regular

expression r. Consider the following three statements :

S1. L(r*) = (L(r))*

S2. L(r1 + r2) = L(r1) ∩ L(r2)

S3. L(r1.r2) = L(r1)L(r2)

Which of the following is true ?

(A) ○ Only S1 is false
(B) ○ **Only S2 false (Correct Answer)**
(C) ○ Only S3 false
(D) ○ All S1, S2 and S3 are true

Question No.95 (Question Id - 57)
Which of the following is true about the program counter ?
(A) ○ It stores the contents of memory
(B) ○ It stores the program instructions
(C) ○ It stores the contents of program status word register
(D) ○ **It stores the address of next memory location (Correct Answer)**

Question No.96 (Question Id - 69)
Consider the following assumptions :
A :   All dictionaries are useful.
B :   Reenu owns only comedy books.
C :   No comedy book is useful.
Consider the following statements :
S1 :   Comedy books are not dictionaries.
S2 :   All useful books are dictionaries.
(A) ○ Both S1 and S2 are valid
(B) ○ **Only S1 is valid (Correct Answer)**
(C) ○ Only S2 is valid
(D) ○ Neither S1 nor S2 is valid

Question No.97 (Question Id - 51)

Let X be a random variable with probability density function

$$f_X(x) = \begin{cases} ax+b, & 2 \le x \le 3 \\ 0, & \text{Otherwise} \end{cases}$$

If a + b = 0, the values of a and b are :

(A) ○ -1/2, 1/2
(B) ○ 1/2, -1/2
(C) ○ **2/3, -2/3 (Correct Answer)**
(D) ○ -2/3, 2/3

Question No.98 (Question Id - 29)
Failing to reject the null hypothesis when it is false is :
(A) ○ alpha
(B) ○ Type I error
(C) ○ beta
(D) ○ **Type II error (Correct Answer)**

Question No.99 (Question Id - 83)
Which of the following data structure is used in breadth first search in graph ?

(A) ○ Stack
(B) ○ **Queue (Correct Answer)**
(C) ○ Tree

(D) ○ Array

Question No.100 (Question Id - 48)

Let X be a geometrically distributed random variable with parameter p. Then the expected value of X
is :

(A) ○ **1/p (Correct Answer)**

(B) ○ $1/(1 - p)$

(C) ○ $1/p^2$

(D) ○ $1/(1 - p)^2$

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