

125

QUESTION PAPER
SERIES CODE

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COMPUTER AND SYSTEMS SCIENCES

[Field of Study Code : SCSP (158)]

1.

If L and $\sim L$ (complement of L) are recursive enumerable, then L is

- (a) regular
- (b) context free
- (c) context sensitive
- (d) recursive

2.

If d is not defined on the current state and the current state and the current tape symbol, then the machine

- (a) halts
- (b) does not halt
- (c) goes into loop forever
- (d) None of the above

3.

A language L may not be accepted by a Turing machine if

- (a) it is recursively enumerable
- (b) L can be enumerated by some Turing machine
- (c) it is recursive
- (d) None of the above

4.

The variable which produces an epsilon is called

- (a) empty
- (b) terminal
- (c) non-terminal
- (d) nullable

5.

The construction time for DFA having m nodes from an equivalent NFA is

- (a) $O(m^2)$
- (b) $O(2^m)$
- (c) $O(m)$
- (d) $O(\log m)$

6.

Which of the following is true about a file?

- (a) It is an abstract data type
- (b) It is usually non-volatile
- (c) It is a logical storage unit
- (d) All of the above

7.

Consider a fully associative cache with 8 cache blocks (numbered 0-7) and the following sequence of memory block requests:

4, 3, 25, 8, 19, 6, 25, 8, 16, 35, 45, 22, 8, 3, 16, 25, 7

If LRU replacement policy is used, which cache block will have memory block 7?

- (a) 4
- (b) 5
- (c) 6
- (d) 7

8.

Which of the following is the address generated by the CPU?

- (a) Physical address

- (b) Absolute address
- (c) Logical address
- (d) None of the above

9.

What is interprocess communication?

- (a) Communication within the process
- (b) Communication between two processes
- (c) Communication between two threads of same process
- (d) None of the mentioned

10.

Which of the following storage units has the highest access time?

- (a) Magnetic disk
- (b) Floppy disk
- (c) Cache
- (d) Swapping device

11.

Which of the following is/are the advantage(s) of connection-oriented networking?

- (a) Quality of service
- (b) No priority service
- (c) Bandwidth utilization
- (d) All of the above

12.

PID is used by the system to identify

- (a) a process
- (b) file name
- (c) i-node
- (d) All of the above

13.

In which switching, multiplexing is used?

- (a) Packet switching
- (b) Circuit switching
- (c) Data switching
- (d) All of the above

14.

The purpose of subnetting is

- (a) it divides one large network into several smaller ones
- (b) it divides network into network classes
- (c) it speeds up the speed of network
- (d) None of the above

15.

The natural mask for a class C network is

- (a) 255.255.255.1
- (b) 255.255.255.0
- (c) 255.255.255.254
- (d) 255.255.255.255

16.

Which is not true about an AVL tree of n nodes?

- (a) Average space complexity is $O(n)$
- (b) Average space complexity is $O(\log(n))$
- (c) Worst space complexity is $O(n^2)$
- (d) Average insert complexity is $O(\log(n))$

17.

The logical relationship among data items is defined by

- (a) data structure
- (b) data relationship
- (c) storage structure
- (d) data operation

18.

One generally uses which of the following data structures to recollect some past happening/event?

- (a) Array
- (b) Queue
- (c) Stack
- (d) Link

19.

The time complexity of inserting a node in a doubly linked list is

- (a) $O(n^2 \log(n))$
- (b) $O(n \log(n))$
- (c) $O(\log(n))$
- (d) $O(n)$

20.

Which of the following is not an application of priority queue?

- (a) Huffman code
- (b) Interrupt handling in operating system
- (c) Undo operation in text editors
- (d) Bayesian spam filter

21.

The inverse of function $f(x) = (x^2 + 1)^3$ is

- (a) $(y^{1/3} - 1)^{1/2}$
- (b) $(y^{1/3} - 1)^2$
- (c) $(y^{1/2} - 1)^{1/3}$
- (d) $(y^{1/6} - 1)$

22.

The domain of the function $f(x) = x^{1/2}$ is

- (a) $(-\infty, +\infty)$
- (b) $(2, \infty)$
- (c) $(-\infty, 1)$

(d) $(0, \infty)$

23.

A function f is defined from set A to set B . A and B have m and n ($m \leq n$) elements, respectively. Then the number of one-to-one functions is

(a) ${}^n C_m \times m!$

(b) ${}^n C_m \times n!$

(c) ${}^m C_n \times m!$

(d) ${}^m C_n \times n!$

24.

Floor $(3.7) + \text{Ceil}(6.5)$ is equal to

(a) 11

(b) 10

(c) 9

(d) 8

25.

Let A be defined as $\{\{\Phi\}, \{\Phi, \{\Phi\}\}\}$. Then the power set of A has the number of elements is

(a) 10

(b) 8

(c) 6

(d) 4

26.

Let $f(x)$ be defined as $3x^2 + x^3 \log(x)$. Then $f(x)$ is

(a) $O(x^2)$

(b) $O(x^3)$

(c) $O(x^4)$

(d) $O(x)$

27.

In relational model, the relations are viewed as

- (a) tuples
- (b) attributes
- (c) tables
- (d) rows

28.

In an E-R diagram, an entity set is represented by a/an

- (a) ellipse
- (b) rectangle
- (c) diamond box
- (d) circle

29.

The database level closest to the users is

- (a) external
- (b) internal
- (c) physical
- (d) conceptual

30.

Let R1 and R2 be two relations. The UNION operation on R1 and R2 will give

- (a) all tuples of R1
- (b) all tuples of R2
- (c) all tuples of R1 and R2
- (d) all tuples of R1 and R2 having common columns

31.

A primary key combined with a foreign key creates

- (a) parent-child relationship between tables that connect them
- (b) many to many relationship between tables that connect them
- (c) Network model between tables that connect them
- (d) None of the above

32.

Which is/are integer constant(s)?

- (a) Decimal integer constant
- (b) Octal integer constant
- (c) Hexadecimal constant
- (d) All of the above

33.

Suppose an expression contains assignment, relational and arithmetic operators and has no parenthesis. Then their order of evaluation is

- (a) arithmetic, relational, assignment
- (b) arithmetic, assignment, relational
- (c) relational, assignment, arithmetic
- (d) assignment, arithmetic, relational

34.

In an assignment statement $a=b$, which of the following is correct?

- (a) The variables a and b are same
- (b) The value of b is assigned to variable a ; later if the value of b changes, it will affect the value of a
- (c) The value of b is assigned to variable a ; later if the value of b changes, it will not affect the value of a
- (d) The value of variable a is assigned to variable b and the value of b is assigned to variable a

35.

The operators $\&\&$ and $\|\|$ are used to

- (a) compare two numeric values
- (b) compare two Boolean values
- (c) combine two numeric values of short
- (d) combine different types of values

36.

Which of the following functions need not to have return statement in its body?

- (a) `int a(char *s)`

- (b) float *b()
- (c) void c(int y[], int n)
- (d) short d(long x)

37.

The rank of any general 100×1000 matrix cannot be greater than

- (a) 1000
- (b) 500
- (c) 10
- (d) 100

38.

The number of solutions of

$$\begin{pmatrix} 1 & 0 & 5 \\ 0 & 1 & 6 \\ 1 & 0 & 5 \end{pmatrix} X = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$$

is

- (a) 0
- (b) 1
- (c) infinite
- (d) None of the above

39.

The determinant

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 4 \\ 1 & 3 & 9 \end{vmatrix}$$

is

- (a) 0
- (b) 2
- (c) 6
- (d) 24

40.

Consider the group S_3 of all permutations of 3 letters. Which of the following properties does it satisfy?

- (a) Finitely generated
- (b) Cyclic
- (c) Abelian
- (d) Simple

41.

The remainder obtained after $x^4 + x^2 + 1$ is divided by $x^2 + x + 1$ is

- (a) 1
- (b) x
- (c) $x^2 - x + 1$
- (d) 0

42.

Which of the following sets is a subgroup of the additive group of real numbers?

- (a) Positive real numbers
- (b) Non-negative real numbers
- (c) Even integers
- (d) Odd integers

43.

Consider the function $f(x) = |x|$, $x \in \mathbb{R}$ (set of real numbers). It is

- (a) differentiable everywhere
- (b) continuous everywhere
- (c) differentiable at 0 only
- (d) None of the above

44.

Let $y = f(x)$. Then

$$\frac{d^2x}{dy^2}$$

is

(a) $-\frac{\frac{d^2y}{dx^2}}{\left(\frac{dy}{dx}\right)^3}$

- (b) $\frac{\frac{d^2y}{dx^2}}{\left(\frac{dy}{dx}\right)^3}$
- (c) $\frac{\frac{dy}{dx}}{\left(\frac{d^2y}{dx^2}\right)^3}$
- (d) $-\frac{\frac{dy}{dx}}{\left(\frac{d^2y}{dx^2}\right)^3}$

45.

The function

$$f(x) = \begin{cases} x \sin(\log x^2), & x \neq 0 \\ 0, & x = 0 \end{cases} \quad \text{at } x = 0$$

is

- (a) discontinuous
- (b) differentiable
- (c) non-differentiable
- (d) None of the above

46.

The points where

$$f(x) = \lim_{n \rightarrow \infty} \left(\sin \frac{\pi x}{2} \right)^{2n}$$

is discontinuous are

- (a) $x = n$, n is an integer
- (b) $x = (2n+1)$, n is an integer
- (c) $x = 2n$, n is an integer
- (d) $x = (2n+1)/2$, n is an integer

47.

$\int e^x(x+1) \cos(xe^x) dx$ is equal to

- (a) $e^x \cos(x) + C$
- (b) $e^x \sin(x) + C$
- (c) $\cos(e^x x) + C$
- (d) $\sin(e^x x) + C$

48.

$\int \frac{2\sin(x)+3\cos(x)}{\sin(x)+4\cos(x)} dx = ax + b.\log(|\sin(x) + 4\cos(x)| + c)$. Then a+b is equal to

- (a) $\frac{-19}{17}$
- (b) $\frac{19}{17}$
- (c) $\frac{9}{17}$
- (d) $\frac{-9}{17}$

49.

The order of convergence of Regula falsi method is

- (a) 1.618
- (b) 1.321
- (c) 1.931
- (d) 2.012

50.

The numerical integration using the Simpson's rule for which step size h has error of order

- (a) h
- (b) h^2
- (c) h^3
- (d) 1

51.

Parrot : Cage :: Man : ?

- (a) Home
- (b) Motor car
- (c) Prison
- (d) Forest

52.

UTS : FDC :: WVU : ?

- (a) YWV

- (b) WXY
- (c) UVX
- (d) HGF

53.

RAP, MAP, HOT, FUN, ?

- (a) HNP
- (b) CAT
- (c) PGD
- (d) STN

54.

A/2, B/4, C/6, D/10, ?

- (a) E/16, F/26
- (b) E/12, F/16
- (c) E/12, F/14
- (d) D/10, E/10

55.

In a code language 251 means 'you are good', 137 means 'we are bad', 359 means 'good and bad'. Find the code for 'and'.

- (a) 1
- (b) 2
- (c) 3
- (d) 9

56.

ADG, GJM, ?

- (a) NOP
- (b) MPS
- (c) MOQ
- (d) WTV

57.

11, 33, 55, 77, ?

- (a) 99
- (b) 88
- (c) 121
- (d) 165

58.

If $3 \times 6 = 18$, $5 \times 3 = 15$, $8 \times 2 = 16$, find the value of $4 \times 6 = ?$

- (a) 15
- (b) 18
- (c) 20
- (d) 23

59.

Pen is to poet as needle is to

- (a) thread
- (b) tailor
- (c) button
- (d) sewing

60.

Statement: Should the education be made by the Govt. free of charge?

Reason A: Yes, it will help in universalization of education in the country.

Reason B: No, there will be budgetary deficit creating some new problems.

- (a) only A is strong
- (b) only B is strong
- (c) Both are strong
- (d) None is strong

61.

In hypothesis testing, the level of significance of a test is the probability of

- (a) committing a type I error
- (b) committing a type II error
- (c) not committing a type I error

(d) not committing a type II error

62.

The _____ test is not used to compare the parameters (like mean, variance, proportion etc.) of two different samples.

- (a) z
- (b) t
- (c) χ^2
- (d) F

63.

In hypothesis testing, the power of a test is the probability of

- (a) committing a type I error
- (b) committing a type II error
- (c) not committing a type I error
- (d) not committing a type II error

64.

The choice of t-test is done when a _____ sample is taken from a population with _____ variance.

- (a) large, known
- (b) small, unknown
- (c) large, unknown
- (d) small, known

65.

For a population with known variance σ_p^2 and unknown mean μ_p , the null hypothesis is taken as $H_0 : \mu_p = \mu$. A sample of size n is drawn from this population with sample mean \bar{X} and sample variance σ_s^2 . Then the statistic used for performing the z-test to test H_0 is computed by

- (a) $z = \frac{\bar{X} - \mu}{\sigma_p^2/n}$
- (b) $z = \frac{\bar{X} - \mu}{\sigma_s^2/(n-1)}$
- (c) $z = \frac{\bar{X} - \mu}{\sigma_s/\sqrt{n}}$

(d) $z = \frac{\bar{X} - \mu}{\sigma_p / \sqrt{n}}$

66.

For a population with population variance σ_p^2 , and a sample with sample variance σ_s^2 , the statistic used for performing the χ^2 -test to test $H_0 : \sigma_p^2 = \sigma_s^2$ is computed by

- (a) $\chi^2 = \sigma_s^2 / \sigma_p^2$
- (b) $\chi^2 = (n - 1)\sigma_s^2 / \sigma_p^2$
- (c) $\chi^2 = \sigma_s^2 / (n \sigma_p^2)$
- (d) $\chi^2 = n\sigma_s^2 / \sigma_p^2$

67.

The sample mean is given by $\bar{X} = \frac{1}{n} \sum X_i$ where the sample is given by $\{X_1, X_2, \dots, X_n\}$. Which of the formula is the correct expression for the sample variance σ_s^2 ?

- (a) $\frac{1}{n} \sum X_i^2$
- (b) $\frac{1}{n} \sum X_i^2 - \bar{X}^2$
- (c) $\frac{1}{n-1} \sum (X_i^2 - \bar{X})^2$
- (d) $\frac{1}{n} \sum (X_i^2 - \bar{X})^2$

68.

The probability $P(|X - \mu| \leq \sigma)$, where X is a random variable following normal distribution with mean μ and variance σ^2 , is approximately?

- (a) 0.68
- (b) 0.83
- (c) 0.95
- (d) 1

69.

Given that X is a random variable with first moment 10 and second moment 90, what is its standard deviation?

- (a) 100
- (b) $\sqrt{90}$
- (c) $\sqrt{10}$
- (d) 10

70.

The mean of the binomial probability distribution is 857.6 and the probability is 64%, then the number of values of the binomial distribution is

- (a) 1040
- (b) 1340
- (c) 1240
- (d) 1140

71.

Tail or head, one or zero, and girl or boy are examples of

- (a) complementary events
- (b) non-functional events
- (c) non-complementary events
- (d) functional events

72.

Condition for negative exponential distribution considering mean (μ) is that

- (a) μ must be less than zero
- (b) μ must be greater than one
- (c) μ must be greater than zero
- (d) μ must be smaller than two

73.

A bag contains 5 black and 10 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

- (a) $1/2$
- (b) $2/3$
- (c) $3/4$
- (d) $4/5$

74.

Which of the following is a class indication of quality of a research journal?

- (a) Impact factor
- (b) h-index
- (c) g-index
- (d) i10-index

75.

The number of significant digits in the number 2.0400×10^2 is

- (a) 2
- (b) 3
- (c) 4
- (d) 5

76.

The independent variables that are not related to the purpose of the study but may affect the dependent variable are termed as

- (a) extraneous variables
- (b) inductive variables
- (c) intrinsic variables
- (d) extrinsic variables

77.

Primary data can be collected by conducting survey. In which of the following ways is/are the survey conducted by?

- (a) Interview
- (b) Observation
- (c) Questionnaire
- (d) All of the above

78.

Truncation error in the number 5.217 truncated to 5.21 is

- (a) 0.0013%
- (b) 0.013%
- (c) 0.13%
- (d) 1.3%

79.

Absolute error in a measurement value of a physical quantity is

- (a) difference between measured value and its true value
- (b) ratio of measured value and true value
- (c) measured value plus true value
- (d) difference between measured and true values divided by true value

80.

Relative error in a physical quantity is

- (a) difference between measured value and true value
- (b) ratio of absolute error and the measured value of the physical quantity
- (c) ratio of measured value and true value
- (d) ratio of true value and measured value

81.

Type-I error means

- (a) rejection of hypothesis which should have been accepted
- (b) accepting the hypothesis which should have been rejected
- (c) accepting the hypothesis which should have been accepted
- (d) rejection of hypothesis which should have been rejected

82.

Which of the following is not a formal experimental design?

- (a) Completely randomized
- (b) Randomized block
- (c) Factorial
- (d) Roman square

83.

Statistical constants of the population are called

- (a) statistics
- (b) parameters
- (c) variables
- (d) proportions

84.

Statistical measures of the sample are called

- (a) parameters
- (b) variables
- (c) statistics
- (d) proportions

85.

Data obtained in Census survey is

- (a) free from sampling errors
- (b) free from non-sampling errors
- (c) free from biased errors
- (d) free from all errors

86.

Which of the following sampling methods is based on probability?

- (a) Convenience sampling
- (b) Quota sampling
- (c) Judgement sampling
- (d) Stratified sampling

87.

Which of the following is not an informal experimental design?

- (a) Before-and-after without control
- (b) Before-only with control
- (c) Before-and-after with control
- (d) After-only with control

88.

Type-II error means

- (a) rejection of hypothesis which should have been accepted
- (b) rejection of hypothesis which should have been rejected
- (c) accepting the hypothesis which should have been rejected
- (d) accepting the hypothesis which should have been accepted

89.

Principle of randomization provides

- (a) better estimation of experimental error
- (b) better estimation of sampling error
- (c) protection against experimental error
- (d) protection against sampling error

90.

Principle of local control

- (a) eliminates experimental error
- (b) eliminates variability caused by extraneous factor from experimental error
- (c) eliminates variability caused by sampling
- (d) eliminates variability caused by any kind of factor

91.

Which of the following is a type of factorial design?

- (a) Heterogeneous factorial design
- (b) Simplex factorial design
- (c) Simple factorial design
- (d) Homogeneous factorial design

92.

In the context of hypothesis testing, which of the following options is the meaning of the statement "Test the hypothesis at 10% level of significance"?

- (a) The null hypothesis H_0 would be rejected when the sampling result has a less than 0.1 probability occurrence when H_0 is true

- (b) The risk of rejecting the alternative hypothesis is 10%
- (c) The percentage of type I error is 10%
- (d) The probability of a false negative is 0.1

93.

To conduct an experimental hypothesis-testing research, the group that is exposed to certain new or specific conditions is called _____ group.

- (a) control
- (b) subject
- (c) object
- (d) experimental

94.

Sampling design refers to the procedure adopted by a researcher to select items from _____.

- (a) examples
- (b) samples
- (c) universe
- (d) pool

95.

Which one of the following is not a type of research design?

- (a) Descriptive and diagnostic research design
- (b) Exploratory research design
- (c) Hypothesis-testing research design
- (d) Confirmatory research design

96.

Which of the following types of data is not numerical in nature?

- (a) Interval
- (b) Nominal
- (c) Ordinal
- (d) Ratio

97.

Ranking and rating are important _____ techniques.

- (a) sampling
- (b) measurement
- (c) scaling
- (d) testing

98.

Which of the following is not a sample design?

- (a) Chance
- (b) Quota
- (c) Random
- (d) Focus

99.

The principle of replication, principle of randomization and principle of local control are three principles of _____.

- (a) sampling
- (b) measurement
- (c) ranking
- (d) experimental design

100.

The cost of _____ involved in sampling analysis determines the selection of the sampling procedure.

- (a) computers
- (b) data preprocessing
- (c) data storage devices
- (d) drawing incorrect inference from the selected data

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