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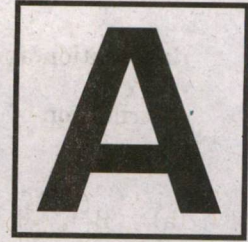
T.B.C. : GVP-U-STSS

Test Booklet Series

Serial **1005337**

A

TEST BOOKLET

STATISTICS

Paper I

Time Allowed : Two Hours   *Maximum Marks : 200*

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET *DOES NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.

2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.**

3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. *DO NOT* write *anything else* on the Test Booklet.

4. This Test Booklet contains **80** items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose *ONLY ONE* response for each item.

5. You have to mark all your responses *ONLY* on the separate Answer Sheet provided. See directions in the Answer Sheet.

6. All items carry equal marks.

7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.

8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.

9. Sheets for rough work are appended in the Test Booklet at the end.

10. **Penalty for wrong answers :**
    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.

    (i)   There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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1. Suppose X_1, X_2, X_3 and X_4 are independent where X_1, X_2, X_3 has a Bernoulli $\left(\dfrac{1}{3}\right)$ distribution and X_4 follows $B\left(3, \dfrac{2}{3}\right)$. Then the distribution of $X_1 + X_2 + X_3 + 3 - X_4$ is :

(a) $B\left(5, \dfrac{1}{3}\right)$

(b) $B\left(6, \dfrac{1}{3}\right)$

(c) $B\left(6, \dfrac{2}{3}\right)$

(d) not a Binomial

2. A large number of candidates from three States A, B and C appear at a selection test. Suppose 10 candidates are selected independently out of which X, Y, Z are respectively from A, B and C. If a candidate from State A had twice as much chance as one from B or from C to be selected, then cov(Y, Z) equals :

(a) $-\dfrac{5}{4}$

(b) $-\dfrac{5}{8}$

(c) 0

(d) $\dfrac{15}{8}$

3. Suppose $\{X_n : n \geq 1\}$ is a sequence of independent random variables, and for each $n \geq 1$, X takes the values $-\dfrac{3n}{2}$, $-n$, $\dfrac{n}{2}$ and n with probability $\dfrac{1}{4}$ each. Then the sequence $Y_n = \dfrac{1}{n^\alpha} \displaystyle\sum_{i=1}^{n} \dfrac{x_i}{i}$ converges in probability to 0 if and only if :

(a) $\alpha > 1$

(b) $\alpha = 1$

(c) $\alpha \geq 1$

(d) $\alpha > \dfrac{3}{2}$

4. A certain city receives three newspapers A, B and C. Newspaper A has 50% of the readers in that city, newspaper B has 30% of the readers and newspaper C has the remaining 20% of the readers. Assuming that no one in that city reads more than one paper, the probability that among 6 randomly chosen readers in that city, 3 will read newspaper A, 2 will read newspaper B and 1 (one) will read newspaper C, is :

(a) $\dfrac{1}{4}$

(b) $\dfrac{1}{8}$

(c) $\dfrac{27}{100}$

(d) $\dfrac{27}{200}$

5. If X is a Poisson random variable with $P(X = 1) = P(X = 2)$, then what is $V(X)$ equal to ?

   (a)   0

   (b)   1

   (c)   2

   (d)   3

6. If X has binomial distribution with $n = 3$ and $p = \dfrac{1}{3}$, then what is the value of $E((X - 1)^3)$?

   (a) $\dfrac{1}{9}$

   (b) $\dfrac{2}{9}$

   (c) $\dfrac{4}{9}$

   (d) $\dfrac{5}{9}$

7. The random variables X and Y have the joint probability mass function given by :

   $$p(x, y) = \begin{cases} \dfrac{x + y}{21} & \text{for } x = 1, 2, 3; \quad y = 1, 2 \\ 0 & \text{otherwise} \end{cases}$$

   What is $P(X - Y \le 0\cdot 5)$ equal to ?

   (a) $\dfrac{2}{3}$

   (b) $\dfrac{4}{7}$

   (c) $\dfrac{3}{7}$

   (d) $\dfrac{17}{21}$

8. A group of 2n boys and 2n girls is divided at random into two equal batches. What is the probability that each batch will be equally divided into boys and girls ?

   (a) $\dfrac{C\,(2n, n)}{C\,(4n, n)}$

   (b) $\dfrac{\{C\,(2n, n)\}^2}{C\,(4n, 2n)}$

   (c) $\dfrac{\{C\,(2n, n)\}^2}{\{C\,(4n, n)\}^2}$

   (d) $\dfrac{C\,(2n, n)}{\{C\,(4n, 2n)\}^2}$

*Consider the following for the next **two** (02) items that follow :*

   Let the joint density function of X and Y be

   $$f(x, y) = \begin{cases} \dfrac{y}{(1 + x)^4}\, \exp\left(-\dfrac{y}{1 + x}\right), & x \ge 0, \ y \ge 0 \\ 0, & \text{otherwise} \end{cases}$$

9. What is the value of $E[Y \mid X = 10]$?

   (a)   22

   (b)   25

   (c)   30

   (d)   32

10. What is the equation of regression of Y on X ?

   (a) $Y = 2X + 2$

   (b) $Y = 3X + 5$

   (c) $Y = (X/2) + 5$

   (d) $Y = 3X + (5/2)$

11. Consider the following bivariate data :

X	1	2	3	4	5
Y	4	1	0	1	4

What is the correlation coefficient ?

(a) 0

(b) $-\dfrac{1}{2}$

(c) -1

(d) 1

12. Let $X_1, X_2, \ldots X_5$ be a random sample of size 5 from a population having standard normal distribution. Let $\overline{X} = \dfrac{\sum_{i=1}^{5} X_i}{5}$ and $T = \sum_{i=1}^{5}(x_i - \overline{X})^2$. What is $E(T^2 + \overline{X}^2)$ equal to ?

(a) 4·0

(b) 4·2

(c) 24·2

(d) 25·2

13. If $(X, Y) \sim$ BVN(10, 20, 100, 100, 0·5), then what is the value of $E(e^{X+Y})$?

(a) e^{150}

(b) e^{180}

(c) e^{100}

(d) e^{220}

14. It is given that n = 4, $\sum x^2 = 164$, $\sum y^2 = 572$, $\sum x = 24$, $\sum y = 44$ and $\sum xy = 300$. What is the estimated value of X when Y = 10 ?

(a) 2·59

(b) 3·59

(c) 4·59

(d) 5·59

15. Let (X_1, X_2) follow bivariate normal with $E(X_1) = E(X_2) = 0$, $V(X_1) = V(X_2) = 1$ and $\mathrm{Corr}(X_1, X_2) = \rho$. What is the value of $E(X_1^2 X_2^2)$?

(a) $\rho^2 + \dfrac{1}{2}$

(b) $\dfrac{\rho^2}{2} + \dfrac{2}{3}$

(c) $3\rho^2 + 4$

(d) $2\rho^2 + 1$

16. For a trivariate distribution, it is given that $r_{12} = r_{13} = r_{23} = r$ where r_{ij} is the correlation coefficient between X_i and X_j for all $i \neq j$. If $R^2_{1.23}$ is the multiple correlation coefficient, then the expression for $(1 - R^2_{1.23})$ is :

(a) $(1-r)(1-2r)(1+r)^{-1}$

(b) $(1-r)(1+2r)(1+r)^{-1}$

(c) $(1-r)(1-2r)(1-r)^{-1}$

(d) $(1-r)(1+2r)(1-r)^{-1}$

17. If X is normally distributed with mean μ and variance 1 and Y^2 is independently distributed as central χ^2 with f degrees of freedom, then what is the value of

$$\int_{-\infty}^{\infty} \int_{0}^{\infty} y^{f-2} \, e^{\frac{-(x^2 + y^2)}{2} + \mu x} \, dy^2 \, dx \; ?$$

(a) $\Gamma\left(\dfrac{f}{2}\right) 2^{\frac{\mu+1}{2}}$

(b) $\Gamma\left(\dfrac{f}{2}\right) 2^{\frac{f+1}{2}} \sqrt{\pi} \, e^{\frac{\mu^2}{2}}$

(c) $\sqrt{\pi} \, e^{\frac{\mu^2}{2}}$

(d) $\Gamma\left(\dfrac{f}{2}\right) 2^{\frac{f+1}{2}} \sqrt{\pi} \, e^{-\frac{\mu^2}{2}}$

18. Let $(X, Y) \sim BVN(0, 0, 1, 1, \rho)$.

Consider the following statements :

1. $(X + Y)$ and $(X - Y)$ are independently distributed.

2. $(X + Y)$ follows normal distribution with mean 0 and variance $2(1 + \rho)$.

3. $(X - Y)$ follows normal distribution with mean 0 and variance $2(1 - \rho)$.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

19. If r is a sample correlation coefficient in a random sample of size n from a bivariate normal population with $\rho = 0$, then the distribution of r^2 is :

(a) $\beta(1, n - 2)$

(b) $\beta(1/2, (n - 2)/2)$

(c) $\beta(2, n - 3)$

(d) $\beta(1/3, (n - 3)/3)$

20. If $R_{1.23} = 0$, then which of the following statements is/are correct ?

1. X_1 is uncorrelated with X_2 and X_3.

2. X_2 is uncorrelated with X_3.

3. $(1 - r_{12}^2)(1 - r_{13.2}^2) = 1$.

Select the correct answer using the code given below :

(a) 1 only

(b) 1 and 2

(c) 1 and 3

(d) 2 and 3

21. Suppose f is a three time differentiable function on [0, 2]. The integral $\int_0^2 f(x)\,dx$ is computed using trapezoidal rule partitioning [0, 2] into 10 equal sub-intervals. Then the error is given by :

(a) $-\dfrac{2}{25}\,f'(t)$ for some $t \in [0, 2]$

(b) $-\dfrac{1}{150}\,f''(t)$ for some $t \in [0, 2]$

(c) $-\dfrac{1}{300}\,f''(t)$ for some $t \in [0, 2]$

(d) $-\dfrac{1}{150}\,f'''(t)$ for some $t \in [0, 2]$

22. Euler method is used to solve the initial value problem $\dfrac{dy}{dt} = \sin y$, $y(0) = 1$, $t \in (0, 7)$. Then the local truncation error is always bounded by :

(a) $\dfrac{h}{2}$

(b) $\dfrac{h^2}{2}$

(c) $\dfrac{h^2}{4}$

(d) $\dfrac{3h}{2}$

23. What is $\left(\dfrac{\Delta^2}{E}\right) e^x \times \dfrac{Ee^x}{\Delta^2 e^x}$ equal to ?

(with interval of differencing equal to h)

(a) 0

(b) e^{-x}

(c) e^{2x}

(d) e^x

24. Consider the following data :

x	0	1·0	1·5	2·0
f(x)	1·1	2·4	5·7	8·1

Let $I = \int_0^2 f(x)\,dx$. Application of combination of Trapezoidal rule on [0, 1] and Simpson's one-third rule on [1, 2] gives the value of I as :

(a) 7·30

(b) 5·55

(c) 3·65

(d) 3·33

25. What is $\dfrac{1}{E-8}\,(x^2 2^x)$ equal to ?

(take interval of differencing to be unity)

(a) $-\dfrac{2^x}{54}\,(9x^2 - 6x - 1)$

(b) $\dfrac{2^x}{54}\,(9x^2 - 6x - 1)$

(c) $-\dfrac{2^x}{54}\,(9x^2 + 6x + 5)$

(d) $\dfrac{2^x}{54}\,(9x^2 + 6x + 5)$

26. Bessel's interpolation formula is most appropriate when $p = (x - x_0)/h$:

    (a) lies between -0.25 and $+0.25$

    (b) lies between 0.25 and 0.75

    (c) lies between 0.75 and 1

    (d) is greater than 1

27. Applying Lagrange's formula inversely, the value of x from the data $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y_x = 7$ is approximately :

    (a) 1.86

    (b) 1.98

    (c) 2.16

    (d) 2.36

28. Central finite difference approximation for second order derivative of $f(x)$ at x_i with equally spaced points of step length h is :

    (a) $\dfrac{f_{i-1} + f_i + f_{i+1}}{h^2}$

    (b) $\dfrac{f_{i+1} - f_{i-1}}{2h^2}$

    (c) $\dfrac{f_{i-1} - 2f_i + f_{i+1}}{h^2}$

    (d) $\dfrac{f_i - 2f_{i-1} + f_{i-2}}{h^2}$

29. If $f(x) = \dfrac{1}{x}$, then the value of $f(x_1, x_2, \ldots \ldots \ldots, x_n)$ is equal to :

    (a) $(-1)^n \dfrac{1}{x_1 x_2 \ldots \ldots x_n}$

    (b) $(-1)^{n-1} \dfrac{1}{x_1 x_2 \ldots \ldots x_n}$

    (c) $\dfrac{n}{x_1 x_2 \ldots \ldots x_n}$

    (d) $\dfrac{1}{x_1 x_2 \ldots \ldots x_n}$

30. What is $E(\Delta^n e^{ax+b})$ equal to ?

    (Step length $h = 1$)

    (a) $e^{ax+b} (e^a - 1)^{n+1}$

    (b) $e^{ax+b} e^a (e^a - 1)^n$

    (c) $e^{ax+b} (e^a - 1)^n$

    (d) $e^{ax+b} e^a (e^a - 1)^{n+1}$

31. Which one of the following registers keeps track of the next instruction to be executed ?

   (a)   Program counter

   (b)   Instruction register

   (c)   Accumulator RAM

   (d)   Memory Address Register

32. The highest digit possible in any number system is :

   (a)   equal to base of the number system

   (b)   equal to one less than the base of the number system

   (c)   equal to one more than the radix of number system

   (d)   equal to two less than the base of the number system

33. Consider the following conditions :

   1.   Mutual exclusion

   2.   Hold and wait

   3.   No pre-emption

Under which of the above conditions deadlock situation may arise ?

   (a)   1 and 2 only

   (b)   1 and 3 only

   (c)   2 and 3 only

   (d)   1, 2 and 3

34. Which one of the following refers to associative memory ?

   (a)   The address of the data is generated by the CPU

   (b)   The address of the data is supplied by the users

   (c)   The data are accessed sequentially

   (d)   There is no need for an address because the data is used as an address

35. The 2's complement representation of the number -59 in an 8-bit word size computer system is :

   (a)   11000100

   (b)   11000101

   (c)   00111011

   (d)   11011010

36. Which of the following are raster image formats ?

   1.   JPEG

   2.   GIF

   3.   PNG

   4.   SVG

Select the correct answer using the code given below :

   (a)   1, 2 and 3

   (b)   1, 2 and 4

   (c)   1, 3 and 4

   (d)   2, 3 and 4

37. Data Encryption Standard (DES) is :

   (a)   Asymmetric-key cryptographic algorithm

   (b)   Symmetric-key cryptographic algorithm

   (c)   High speed data transmission algorithm

   (d)   Low speed data transmission algorithm

38. Which one of the following is a dedicated phone line that connects a computer to internet ?

(a) Dial-up access

(b) Digital subscriber line

(c) Integrated Services Digital Network

(d) Leased line

39. In octal number system, the hexadecimal number (32FC.75) is equivalent to :

(a) $(31375.452)_8$

(b) $(73256.732)_8$

(c) $(31374.352)_8$

(d) $(26753.175)_8$

40. Consider the following statements about Batch processing operating systems :

1. All jobs are processed as per their priority.

2. The debugging of a program at execution time is not possible in this system.

3. After the execution of one job, next job is fetched automatically.

Which of the above statements are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

41. A sequence of independent and identically distributed (i.i.d.) random variables $\{X_k\}$ obeys the strong law of large numbers if :

(a) $\text{Var}(X_k) < \infty$

(b) $\text{Var}(X_k) = \infty$

(c) $E(X_k) < \infty$

(d) Information is insufficient to conclude

42. An urn contains 3 white and 4 black balls. A ball is drawn at random. Its colour is noted and returned to the urn along with two additional balls of the same colour. If a ball is drawn again from the urn, then what is the probability that the ball drawn is white ?

(a) $\dfrac{3}{7}$

(b) $\dfrac{4}{7}$

(c) $\dfrac{1}{3}$

(d) $\dfrac{5}{9}$

43. Let X be a continuous variable with density $f(x) = \dfrac{1}{2} e^{-|x|}$; $-\infty < x < \infty$. What is $P(-1 < X < 2)$ equal to ?

(a) $\dfrac{1}{2}(2 - e^{-1} - e^{-2})$

(b) $\dfrac{1}{2}(2 + e^{-1} - e^{-2})$

(c) $\dfrac{1}{2}(2 - e^{-1} + e^{-2})$

(d) $\dfrac{1}{2}(2 + e^{-1} + e^{-2})$

44. A box contains two coins, one of which is "fair" and the other is "two headed". One coin is chosen at random and tossed twice. If two heads appear, then what is the probability that the chosen coin was "two headed" ?

(a) $\dfrac{1}{2}$

(b) $\dfrac{1}{3}$

(c) $\dfrac{1}{4}$

(d) $\dfrac{4}{5}$

45. What is the limiting distribution function of the sequence of distribution functions

$$F_n(x) = \begin{cases} 0, & \text{for} \quad x < -n \\ \dfrac{x+n}{2n}, & \text{for} \quad -n \le x \le n \\ 1, & \text{for} \quad x > n \end{cases} \ ?$$

(a) Distribution function of a random variable degenerating at 0

(b) Distribution function of a random variable degenerating at 1

(c) Distribution function of a U(0, 1) random variable

(d) The limiting distribution function does not exist

46. The probability that in a sequence of Bernoulli trials, the pattern SFSF appears infinitely often, is equal to :

(a) 1

(b) $\dfrac{1}{2}$

(c) $\dfrac{1}{4}$

(d) 0

47. The pdf of a random variable X is given by

$$f(x) = \begin{cases} \dfrac{kx^3}{(1+2x)^6}, & x > 0 \\ 0, & \text{otherwise} \end{cases}.$$

What is the value of k ?

(a) 80

(b) 160

(c) 240

(d) 320

48. A beta distribution of first type with parameters m and n has mean $\dfrac{1}{3}$ and variance $\dfrac{2}{63}$. What are the values of m and n respectively ?

(a) 2, 4

(b) 4, 2

(c) 2, 2

(d) 3, 6

49. Let (X, Y) be jointly distributed with pdf $f(x, y) = 2$, $0 < x < y < 1$. The marginal pdf of Y is :

(a) $f(y) = 1 - y$, $0 < y < 1$

(b) $f(y) = 2y$, $0 < y < 1$

(c) $f(y) = 1 - 2y$, $0 < y < 1$

(d) $f(y) = 2 - 3y$, $0 < y < 1$

50. The distribution function of a random variable X is given by :

$$F(x) = \begin{cases} 0; & x < 0 \\ \dfrac{x}{5}; & 0 \le x \le 5 \\ 1; & x > 5 \end{cases}$$

What is $P[1 \cdot 5 \le X \le 2 \cdot 5]$ equal to ?

(a) 1

(b) $\dfrac{3}{5}$

(c) $\dfrac{2}{5}$

(d) $\dfrac{1}{5}$

51. For a set of n observations $x_1, x_2, \ldots x_n$, consider the following ratios :

1. If $R = \dfrac{\sum_{i=1}^{n} |x_i - M|}{\sum_{i=1}^{n} |x_i - \overline{x}|}$, where

   M (median) $\neq \overline{X}$ (mean), then $R < 1$.

2. If $R = \dfrac{\sum_{i=1}^{n} (x_i - A)^2}{\sum_{i=1}^{n} (x_i - \overline{X})^2}$, where

   A (assumed mean) $\neq \overline{X}$ (mean), then $R > 1$.

3. If $R = \dfrac{\sum_{i=1}^{n} (x_i - M)^2}{\sum_{i=1}^{n} (x_i - \overline{X})^2}$, where

   M (median) $\neq \overline{X}$ (mean), then $R > 1$.

Which of the statements given above are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

52. Let X_i be i.i.d. random variables where $i = 1, 2, 3, \ldots n$ with c.d.f. $F(x)$ and p.d.f. $f(x)$. Then the p.d.f. $g_z(x)$, where $Z = \min \{X_1, X_2, \ldots X_n\}$ is :

(a) $n[F(x)]^{n-1} f(x)$

(b) $n[1 - F(x)]^{n-1} f(x)$

(c) $[1 - F(x)]^{n-1} f(x)$

(d) $[F(x)]^{n-1} f(x)$

53. Which one of the following non-parametric tests is analogous to a Chi-square test of goodness of fit ?

(a) Mann-Whitney test

(b) Kolmogorov-Smirnov test

(c) Wilcoxon test

(d) Median test

54. If it is desired to test $H_0 : \sigma^2 = \sigma_0^2$ in a normal distribution $N(0, \sigma^2)$, then the appropriate test would be :

(a) t-test

(b) Chi-square test

(c) F-test

(d) Normal test

55. Let $\beta_n = E[\,|x|^n\,]$ be the nth absolute moment about origin. Consider the following statements for non-degenerate random values :

1. $\beta_k^{\frac{1}{k}} > \beta_{k+1}^{\frac{1}{k+1}}$ for k = 1, 2, 3, ...

2. $\beta_1 \le \beta_2^{\frac{1}{2}} \le \beta_3^{\frac{1}{3}} \le ... \le \beta_n^{\frac{1}{n}}$

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

56. Consider the following data in respect of COVID-19. Among 1482 persons in a locality exposed to COVID-19, 368 persons were attacked with the virus. Among 1482 persons, 343 persons were vaccinated and among them only 35 persons were attacked with the virus. Which of the following statements is/are correct ?

1. Vaccination and attack are positively associated.

2. Vaccination may be a preventive measure.

Select the correct answer using the code given below :

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

57. Which one of the following is correct regarding non-parametric methods ?

(a) Sign test uses rank only

(b) Wilcoxon test uses both sign and rank

(c) Mann-Whitney test is a one-sample test

(d) Kruskal-Wallis test is a two-sample test

58. Suppose a person has 10 black, 8 red, 5 green, 12 orange and 15 blue balls. The Chi-square value obtained after testing null hypothesis that the colours of the ball occur with equal frequency is :

(a) 6·9

(b) 5·8

(c) 5·6

(d) 5·4

59. The 95% Confidence Interval for population mean, if a random sample of size 100 is taken from $N(\mu, 25)$ and sample mean is 5·96 is $(Z = 1·96)$

(a) [5·47, 6·45]

(b) [4·98, 6·94]

(c) [5, 6]

(d) [4·1, 6·99]

60. If X has uniform distribution in [0, 1], then pdf of $(-2 \log X)$ is :

(a) Uniform

(b) $\beta\left(\dfrac{1}{2}, \dfrac{1}{2}\right)$

(c) $\chi^2_{n/2}$ degrees of freedom

(d) Exponential with $\theta = 1/2$

61. Consider the following expressions :

1. $E^2 x^2 = (Ex)^2$

2. $E^n = (1 + \Delta)^n$

3. $E^n E^m f(x) = E^{n+m} f(x)$

4. $\Delta^n \Delta^m f(x) = \Delta^{n+m} f(x)$

where n, m are positive integers.

How many of the above expressions are correct ?

(a) Only one expression

(b) Only two expressions

(c) Only three expressions

(d) All four expressions

62. It is given that $f(0) = 5$, $f(1) = 1$, $f(2) = 9$, $f(3) = 25$, $f(4) = 55$. What is the approximate value of $f(5)$ obtained by using Newton-Gregory forward interpolation ?

(a) 108

(b) 110

(c) 112

(d) 115

63. If $y_{10} = 3$, $y_{11} = 6$, $y_{12} = 11$, $y_{13} = 18$ and $y_{14} = 27$, then what is y_4 equal to ?

(a) 3

(b) 4

(c) 9

(d) 27

64. If Δ and ∇ are the forward and the backward difference operators respectively, then what is $\Delta - \nabla$ equal to ?

(a) $-\Delta\nabla$

(b) $\Delta\nabla$

(c) $\Delta + \nabla$

(d) $\dfrac{\Delta}{\nabla}$

65. Consider the data $f(1) = 12$, $f(2) = 40$, $f(3) = 90$, $f(4) = 168$, $f(5) = 280$ and $f(6) = 432$. The polynomial which conforms to the data, is :

(a) $f(x) = x^3 + 5x^2 + 5x + 1$

(b) $f(x) = x^3 + 4x^2 + 6x + 1$

(c) $f(x) = x^3 + 5x^2 + 4x + 2$

(d) $f(x) = x^3 + 5x^2 + 6x$

66. If $u = \Delta[f(x-1)\Delta g(x-1)]$, $v = \nabla[f(x)\Delta g(x)]$ and $w = \Delta[f(x-1)\nabla g(x)]$ with difference interval equal to 1, then which one of the following is correct ?

(a) Only $u = v$

(b) Only $v = w$

(c) Only $u = w$

(d) $u = v = w$

67. Consider the following expressions :

1. $\mu = \sqrt{1 + \dfrac{\delta^2}{4}}$

2. $\Delta = \dfrac{\delta^2}{2} + \delta\sqrt{1 + \dfrac{\delta^2}{4}}$

3. $\nabla = -\dfrac{\delta^2}{2} + \sqrt{1 + \dfrac{\delta^2}{4}}$

How many expressions given above are correct ?

(a) Only one expression

(b) Only two expressions

(c) All three expressions

(d) No expression

68. For the data $f(20) = 512$, $f(30) = 439$, $f(40) = 346$ and $f(50) = 243$, consider the following statements :

1. The function $f(x)$ can be approximated by a polynomial of degree 2.

2. The value of $f(25)$ can be obtained as 477 approximately by using Newton-Gregory forward difference interpolation formula.

Which of the statements given above is/are correct ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

69. What is $\Delta^2\left(\dfrac{a^{4x}}{(a^2-1)^2}\right)$ equal to ?

[with the interval of differencing as 1]

(a) $(a^2 + 1)^4\, a^{4x}$

(b) $\dfrac{a^{4x}}{(a^2 + 1)^2}$

(c) $(a^2 + 1)^2\, a^{4x}$

(d) $\dfrac{a^{4x}}{(a^2 + 1)^4}$

70. What is $\Delta E^2\,[(3x-3)^{(-2)}]$ at $x = 1$ equal to ?

[with the interval of differencing as 1]

(a) $-\dfrac{1}{30}$

(b) $\dfrac{1}{30}$

(c) $-\dfrac{1}{270}$

(d) $\dfrac{1}{270}$

71. On which type of ROM can data be written only once ?

(a) PROM

(b) EPROM

(c) EEPROM

(d) EROM

72. What is the correct sequence of a cycle of a process in execution ?

(a) Ready → Waiting → Executing → Terminated → Blocked

(b) Ready → Waiting → Executing → Blocked

(c) Waiting → Ready → Executing → Blocked

(d) Waiting → Ready → Executing → Terminated

73. By using which of the following units is data processing performed by a computer system ?

1. Monitor

2. Memory unit

3. CPU

Select the correct answer using the code given below :

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

74. Consider the following statements in respect of machine cycle :

1. It consists of four phases, namely fetching, decoding, executing and storing.

2. It is a cycle in which machine language instructions are executed.

3. If a program consists of 6 machine language instructions, 6 separate machine cycles would be executed to run the program.

Which of the statements given above are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

75. Which one of the following provides application independent security and privacy over the internet ?

(a) IP security protocol

(b) Secure socket layer

(c) Internet protocol

(d) Transmission control protocol

76. Which of the following is/are non-volatile ?

1. DRAM

2. SRAM

3. EPROM

Select the correct answer using the code given below :

(a) 1 only

(b) 3 only

(c) 1 and 3

(d) 2 and 3

77. Consider the following network topologies :

1. Bus
2. Star
3. Ring
4. Mesh

In which of the above does the failure of one computer not affect the other computer in the network ?

(a) 1, 2 and 4

(b) 1, 3 and 4

(c) 3 and 4 only

(d) 1 and 2 only

78. Consider the following terms :

1. Shared region
2. Cache memory
3. Message passing
4. Shared memory

Which of the above are related to interprocess communication ?

(a) 1 and 2 only

(b) 1, 2 and 3

(c) 2 and 4 only

(d) 3 and 4 only

79. Which of the following are the goals of an operating system ?

1. Efficient use of CPU
2. Efficient use of memory
3. Efficient use of I/O devices

Select the correct answer using the code given below :

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

80. Which of the following properties of transaction mechanism in a database system are correct ?

1. Atomicity
2. Durability
3. Isolation
4. Security

Select the correct answer using the code given below :

(a) 1, 2 and 3

(b) 1, 2 and 4

(c) 1, 3 and 4

(d) 2, 3 and 4

SPACE FOR ROUGH WORK

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