I.E.S/I.S.S.
Examination - 2025

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T.B.C. : BGSP-A-STS

Test Booklet Series

Serial No.

1008053

TEST BOOKLET

STATISTICS

Paper I

A

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. X follows Beta distribution of first kind Beta (α, β) with $\alpha > 1$ and $\beta > 1$. What is the mode ?

   (a) $\frac{\alpha-1}{\alpha+\beta-2}$

   (b) $\frac{\alpha}{\alpha+\beta}$

   (c) $\frac{\alpha+1}{\alpha+\beta+1}$

   (d) $\frac{\alpha+\beta}{\alpha+\beta-1}$

2. For Beta distribution of first kind Beta (α, β), consider the following statements :

   I. For $\alpha > 1$, $\beta > 1$; density has unique mode.

   II. For $\alpha + \beta = 2$ such that $\alpha = \beta = 1$, all points in [0, 2] are modes.

   Which of the statements given above is/are correct ?

   (a) I only

   (b) II only

   (c) Both I and II

   (d) Neither I nor II

3. Let X be a continuous random variable with the following pdf :

$$f(x) = \begin{cases} \frac{1}{8}; & 2 \le x \le 10 \\ 0; & \text{otherwise} \end{cases}$$

   What is the distribution of $Y = aX + b$, provided $a > 0$?

   (a) $U(8a + b, 12a + b)$

   (b) $U(2a + b, 10a + b)$

   (c) Poisson $(ba^{1/8})$

   (d) None of the above

4. A player rolls a fair dice and simultaneously tosses a fair coin. If the "head" appears on the coin, then the player wins twice the value that appears on the dice. However if the "tail" appears on the coin, then the player wins half of the value that appears on the dice. What is the player's expected win ?

   (a) 10·250

   (b) 8·625

   (c) 7·625

   (d) 4·375

5. A miner is trapped in a mine containing 3 doors. The first door leads to a tunnel that will take him to safety after 3 hours of travel. The second door leads to a tunnel that will return him to the mine after 5 hours of travel. The third door leads to a tunnel that will return him to the mine after 7 hours of travel. Assuming that the miner is equally likely to choose any of the doors, what is the expected length of time until he reaches safety ?

   (a) 15 hours

   (b) 25 hours

   (c) 30 hours

   (d) 35 hours

6. The distribution function of standard Laplace distribution with the pdf

$f(x) = \frac{1}{2}e^{-|x|}, -\infty < x < \infty$ is :

(a) $F_X(x) = \begin{cases} \frac{e^x}{2}, & x \leq 0 \\ 1-\frac{e^{-x}}{2}, & x>0 \end{cases}$

(b) $F_X(x) = \begin{cases} \frac{e^x}{2}, & x \leq 0 \\ \frac{1-e^{-x}}{2}, & x>0 \end{cases}$

(c) $F_X(x) = \begin{cases} \frac{e^{-x}}{2}, & x \leq 0 \\ \frac{e^x}{2}, & x>0 \end{cases}$

(d) $F_X(x) = \begin{cases} \frac{1-e^{-x}}{2}, & x \leq 0 \\ 1, & x>0 \end{cases}$

7. Let X_1 and X_2 have the joint pdf given by $f(x_1, x_2) = \begin{cases} 2, & 0 < x_1 < x_2 < 1 \\ 0, & \text{otherwise} \end{cases}$. What is the marginal distribution of X_1 ?

(a) $f_1(x_1) = 1, 0 < x_1 < 1$

(b) $f_1(x_1) = 2 - 2x_1, 0 < x_1 < 1$

(c) $f_1(x_1) = 2x_1, 0 < x_1 < 1$

(d) $f_1(x_1) = 3x_1^2, 0 < x_1 < 1$

8. Let $k > 0$ be a constant such that pdf of X is given by $f(x) = \begin{cases} kx(1-x), & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$. What is the value of E(X) ?

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

(b) $\frac{1}{4}$

(c) $\frac{1}{6}$

(d) $\frac{1}{8}$

9. Let $M_X(t)$ and $M_Y(t)$ be the moment generating functions of two random variables X and Y respectively, for some $t \in R$. If $E(X) = \frac{1}{2}$, $Var(X) = \frac{1}{4}$ and $M_Y(t) = (0{\cdot}75 + 0{\cdot}25e^{2t})M_X(t)$, where $t \in (-h, h); h > 0$, then what is Var(Y) equal to ?

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

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

(c) 1

(d) 2

10. Let X follow Chi-square distribution with n degrees of freedom. Which of the following statements is/are correct ?

I. $\frac{X-n}{\sqrt{2n}}$ is asymptotically normally distributed with mean 0 and variance 1.

II. $\frac{X}{n}$ is asymptotically normal with mean 1 and variance $\frac{2}{n}$.

Select the answer using the code given below :

(a) I only

(b) II only

(c) Both I and II

(d) Neither I nor II

11. The joint probability of the occurrence of two events A and B is given by the following contingency table :

	B	$\overline{B}$
A	0·4	0·1
$\overline{A}$	0·2	0·3

Consider the following statements :

I. A and B are independent events.

II. $P(A|\overline{B}) + P(\overline{A}|B) > \frac{1}{2}$.

Which of the statements given above is/are correct ?

(a) I only

(b) II only

(c) Both I and II

(d) Neither I nor II

12. If k_r and μ_r' denote respectively the r^{th} cumulant and the r^{th} moment about origin zero of a distribution, then which of the following statements are correct ?

I. $k_1 = \mu_1'$

II. $k_2 = \mu_2' - \mu_1'^2$

III. $k_3 = \mu_3' - 3\mu_2'\mu_1' + 2\mu_1'^3$

Select the answer using the code given below :

(a) I and II only

(b) II and III only

(c) I and III only

(d) I, II and III

13. Let (X, Y) follow bivariate normal distribution with E(X) = E(Y) = 2, V(X) = 100, V(Y) = 144 and Corr(X, Y) = 0·5. Which of the following statements is/are correct ?

I. $E(Y|X = x) = 3{\cdot}2 + 0{\cdot}6x$

II. $V(Y|X = x) = 108$

Select the answer using the code given below :

(a) I only

(b) II only

(c) Both I and II

(d) Neither I nor II

14. In a trivariate distribution, it is given that $r_{12} = 0{\cdot}8$, $r_{13} = -0{\cdot}4$, $r_{23} = 0$. The value of correlation coefficient between X_1 and X_3 after linear effect of X_2 on each of them is eliminated, is :

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

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

(c) $-\frac{1}{3}$

(d) $-\frac{2}{3}$

15. If η_{YX} is the correlation ratio of Y on X, then which of the following statements is/are correct ?

I. η^2_{YX} is independent of change of origin and scale.

II. $\eta_{YX} = \eta_{XY}$

III. $\eta^2_{YX} \geq r^2$ where r is the correlation coefficient between X and Y.

Select the answer using the code given below :

(a) I and II only

(b) III only

(c) I and III only

(d) I, II and III

16. The following is the joint probability mass function of two random variables X and Y :

Y \ X	0	1	2
0	3/28	9/28	3/28
1	3/14	3/14	0
2	1/28	0	0

Which of the following statements is/are correct ?

I. Cov(X, Y) = 3/4

II. E(X) = E(Y)

Select the answer using the code given below :

(a) I only

(b) II only

(c) Both I and II

(d) Neither I nor II

17. Let $(X_1, X_2, \ldots, X_k)$ be a random sample of size k from geometric distribution with parameter p with pmf $f(x) = pq^{x-1}$; x = 1, 2, 3, ... Then $\min(X_1, X_2, \ldots, X_k)$ is distributed geometrically with parameter :

(a) $1 - p^k$

(b) $1 - (1 - p)^k$

(c) $(1 - p)^k$

(d) None of the above

18. If the random variables X and Y have a bivariate normal distribution with parameters μ_1, μ_2, σ_1^2, σ_2^2 and ρ, then the marginal distribution of X is :

(a) $N(\mu_1, \sigma_1^2)$

(b) $N(\mu_1 + \rho \frac{\sigma_1}{\sigma_2}(y - \mu_2), \sigma_1^2)$

(c) $N(\mu_1, \sigma_1^2 (1 - \rho^2))$

(d) $N(\mu_1 + \rho \frac{\sigma_1}{\sigma_2} (y - \mu_2), \sigma_1^2 (1 - \rho^2))$

19. What would be the lowest value of r^2 in a sample of 27 pairs of observations which would be significant at 5% level of significance ? $[t_{25}(0{\cdot}05) = 2{\cdot}06]$

(a) 0·1451

(b) 0·2451

(c) 0·3551

(d) 0·4451

20. The male population in a state is 25 lakh. Among them the number of literates is 2 lakh, the number of criminals is 26000 and the number of literate criminals is 2000. What is the association between literacy and criminality ?

(a) No association

(b) Negatively associated

(c) Positively associated

(d) Association cannot be established

21. What is $\frac{1}{1-E^2}(ab^x)$ equal to, where $0 < b < 1$?

(take the interval of differencing to be unity)

(a) $\frac{ab^x}{1-b^2}$

(b) $\frac{ab^x}{1-a^2}$

(c) $\frac{ab^x}{1-a^4}$

(d) $\frac{ab^x}{1-b^4}$

22. What is the value of $\Delta^5\left(\frac{1}{x}\right)$ at $x = 2$?

(take the interval of differencing to be unity)

(a) 1

(b) -1

(c) $-\frac{1}{21}$

(d) $-\frac{1}{42}$

23. If the 9^{th} divided difference of $f(x) = \frac{1}{x}$ based on points $x_i = ih$, $1 \leq i \leq 10$ is α, then what is the 10^{th} divided difference of $f(x)$ based on points $x_i = ih$, $1 \leq i \leq 11$?

(a) $-\frac{\alpha}{11h}$

(b) $-\frac{\alpha}{10h}$

(c) $\frac{\alpha}{11h}$

(d) $\frac{\alpha}{10h}$

24. The Simpson's one-third rule applied to $\int_0^2 f(x)\,dx$ gives the value 2, where $f(1) = 0{\cdot}5$.

If trapezoidal rule is applied, then what is the value of $\int_0^2 f(x)\,dx$?

(a) 8

(b) 4

(c) 2

(d) 1

25. Consider the following table :

x	0	1/4	1/2	3/4	1
f(x)	1	4/5	2/3	4/7	1/2

Simpson's one-third rule with 4 equal intervals is used to approximate the area bounded by the curve f(x) and x-axis from x = 0 to x = 1. What is the approximate value of the area ?

(a) 0·6951

(b) 0·6944

(c) 0·6932

(d) 0·70

26. Trapezoidal rule is used to find the absolute value of error in evaluating $\int_a^{a+h} f(x)\,dx$.

If the absolute value of error is $\frac{2}{3} f''(\xi)$, $a < \xi < b$, then what is the value of h ?

(a) 2

(b) 3

(c) 4

(d) 8

27. Consider the following statements :

I. Trapezoidal rule for evaluating $\int_a^b f(x)\,dx$ gives exact result for linear polynomial.

II. Trapezoidal rule for evaluating $\int_a^b f(x)\,dx$ gives exact result for quadratic polynomial.

III. Simpson's one-third rule for evaluating $\int_a^b f(x)\,dx$ gives exact result for cubic polynomial.

IV. Simpson's one-third rule for evaluating $\int_a^b f(x)\,dx$ gives exact result for quadratic polynomial.

Which of the statements given above are correct ?

(a) I, III and IV

(b) I and IV only

(c) I and III only

(d) II, III and IV

28. Forward Euler method is used to find numerical solution y_1 at $x = 0{\cdot}2$ with $h = 0{\cdot}2$ of the initial value problem $\frac{dy}{dx} = -2xy^2$, $y(0) = 1$. What is $|y(0{\cdot}2) - y_1|$ approximately equal to ?

(a) 0·0215

(b) 0·0385

(c) 0·9615

(d) 1

29. Picard method is used to find approximate solution $y^{(1)}(x)$ {first iterate of Picard's approximation} of initial value problem $\frac{dy}{dx} = -2xy^2$, $y(0) = 1$. What is the value of $|y^{(1)}(x) - y(x)|$ at $x = 0{\cdot}2$?

(a) 0·9915

(b) 0·9615

(c) 0·0015

(d) 0·0005

30. If $y(x)$ is the solution of $\frac{dy}{dx} = 1 + x + y$, $y(0) = 1$ for step $h = 0{\cdot}1$ by Euler's method, then $y(0{\cdot}3)$ is equal to :

(a) 0·963

(b) 1·125

(c) 1·693

(d) 1·963

31. In which of the following topology, all the nodes are connected to a single backbone cable ?

(a) Mesh

(b) Star

(c) Hybrid

(d) Bus

32. Which device is used for connecting the computers in a star topology ?

(a) Router

(b) Hub

(c) Repeater

(d) Bridge

33. In which type of scheduling is the process allocated to CPU for a specific time period or time slice ?

(a) FCFS

(b) Shortest Job First

(c) Priority

(d) Round Robin

34. Consider the following :

I. Better performance

II. Low price

III. Low power and heat

IV. High reliability

Which of the above are advantages of solid-state storage devices as compared to hard disk drives ?

(a) I, II and III

(b) I, II and IV

(c) I, III and IV

(d) II, III and IV

35. Consider the following statements :

I. The hexadecimal equivalent of octal number 366 is 0F6.

II. The decimal equivalent of hexadecimal number A53 is 2643.

Which of the statements given above is/are correct ?

(a) I only

(b) II only

(c) Both I and II

(d) Neither I nor II

36. Consider the following :

I. Multi-user

II. Multitasking

III. Multiprocessor

Which of the above are correct in respect of Linux operating system ?

(a) I and II only

(b) II and III only

(c) I and III only

(d) I, II and III

37. Which one of the following terms specifies the amount of memory required by an algorithm for performing the desired task ?

(a) Time complexity

(b) Space complexity

(c) Hybrid complexity

(d) Processing complexity

38. In high-level programming languages, what role does the runtime environment play ?

(a) It provides libraries and frameworks for application development.

(b) It executes the compiled machine code directly on the CPU.

(c) It manages memory allocation, garbage collection, and other runtime tasks.

(d) It translates source code into machine code during compilation process.

39. What is the purpose of using breakpoints in debugging ?

(a) To mark a point in the code where execution should pause for inspection.

(b) To measure the time elapsed to run a block of code.

(c) To skip a block of code during execution.

(d) To identify memory leaks in the program.

40. In a client-server Database Management System architecture, which one of the following is primarily responsible for managing database access, security, and data integrity ?

(a) Query processor

(b) Client

(c) Server

(d) Database administrator

Consider the following for the next four (04) items :

Let (X_1, X_2, X_3) be a random vector with the joint pmf given by :

$P(X_1 = x_1, X_2 = x_2, X_3 = x_3) =$

$$\begin{cases} \dfrac{50!}{x_1!x_2!x_3!(50-x_1-x_2-x_3)!}\left(\dfrac{1}{4}\right)^{x_1}\left(\dfrac{1}{4}\right)^{x_2}\left(\dfrac{1}{4}\right)^{x_3}\left(\dfrac{1}{4}\right)^{50-x_1-x_2-x_3} & \text{if } x_1+x_2+x_3 \leq 50 \\ 0; & \text{otherwise} \end{cases}$$

41. The distribution of $(50 - X_1)$ is :

(a) Binomial (50, 1/4)

(b) Binomial (50, 3/4)

(c) Poisson (3/4)

(d) Poisson (1/4)

42. The correlation between X_1 and X_2 is :

(a) – 1/4

(b) – 1/3

(c) 1/4

(d) 1/3

43. What is $E(X_1 \mid X_2 = 5)$ equal to ?

(a) 8

(b) 10

(c) 12

(d) 15

44. What is $V(X_1 \mid X_2 = 5)$ equal to ?

(a) 8

(b) 10

(c) 12

(d) 15

Consider the following for the next three (03) items :

Let random variables X and Y be independently distributed as Poisson (λ) and their moment generating functions together with random variable Z satisfy the following relation $M_Z(t) = M_Y(\log M_X(t))$ for some $t \in (-h, h); h > 0$.

45. What is the value of E(Z) ?

(a) $\lambda + 1$

(b) λ^2

(c) $\lambda^2 + \lambda$

(d) $\lambda^4 + 1$

46. What is the value of Var(Z) ?

(a) $1 + \lambda + \lambda^3$

(b) $1 + \lambda^2 + \lambda^3$

(c) $\lambda^2 + \lambda^3$

(d) $\lambda^2 + \lambda^3 + \lambda^4$

47. What is the moment generating function of random variable Z ?

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

(b) $e^{\lambda[e^{t(e^{\lambda} - 1)} - 1]}$

(c) $e^{\lambda(e^{t^2} - 1)}$

(d) $e^{\lambda[e^{\lambda(e^t - 1)} - 1]}$

48. Use Poisson distribution to compute the probability of getting the ace of spades at least twice in 104 trials of drawing a single card from a pack of well-shuffled cards with replacement (Given $e^{-2} = 0{\cdot}1353$). What is the probability ?

(a) 0·6235

(b) 0·5941

(c) 0·5419

(d) None of the above

49. Let $X_1, X_2, \ldots$ be iid sequence of random variables with common pdf $f(x) = \begin{cases} e^{-x+\theta} & \text{if } x \geq \theta \\ 0, & \text{if } x < \theta \end{cases}$. If $\overline{X_n} = \frac{1}{n}\sum_{i=1}^{n} X_i$, then $\overline{X_n}$ converges in probability to :

(a) $1 - \theta$

(b) $1 + \theta$

(c) $1 - \theta^2$

(d) $1 + \theta^2$

50. The characteristic function of a random variable X is given by $\Phi_x(t) = e^{2t(i-t)}$; $|t| \leq 1$. What is the fourth order central moment of the distribution ?

(a) 12

(b) 24

(c) 36

(d) 48

51. Let $X_1, X_2, \ldots, X_n$ be a random sample from uniform [0, 1] distribution. The asymptotic distribution of empirical cdf distribution function $F_n(x)$ is :

(a) Normal with mean zero and variance 1

(b) Normal with mean zero and variance $x(1-x)/n$

(c) Normal with mean x and variance $x(1-x)/n$

(d) None of the above

52. A two dimensional non-negative continuous random variable (X, Y) has the joint density

$$f(x, y) = \begin{cases} 4xye^{-(x^2+y^2)}; & x \geq 0, y \geq 0 \\ 0; & \text{otherwise} \end{cases}$$

Let $T^2 = X^2 + Y^2$ such that $0 \leq (x^2 + y^2) < \infty$.

The density function of T is given by :

(a) $2t^3e^{-t^2}$

(b) $2t^{\frac{3}{2}}e^{-t^3}$

(c) $3t^2e^{-t^2}$

(d) $3te^{-t^3}$

53. Given that for three distinct attributes A, B and C with $(A) = (\alpha) = (B) = (\beta) = (C) = (\gamma) = N/2$ such that $(ABC) = (\alpha\beta\gamma)$. Which of the following statements is/are correct ?

I. $(AB) = (\alpha\beta), (A\beta) = (\alpha B)$

II. $2(ABC) = (AB) + (AC) + (BC) - N/2$

Select the answer using the code given below :

(a) I only

(b) II only

(c) Both I and II

(d) Neither I nor II

54. If X is uniformly distributed with mean 1 and variance 4/3, then $P[X < 0]$ equals :

(a) 1/2

(b) 1/3

(c) 1/4

(d) 1/8

55. If $X \sim N(\mu, \sigma^2)$, then $P[a \leq X \leq b]$ in terms of cdf of the standard normal distribution $\Phi(.)$ for some constants 'a' and 'b' is :

(a) $\Phi\left(\frac{a-\mu}{\sigma}\right) - \Phi\left(\frac{b-\mu}{\sigma}\right)$

(b) $\Phi\left(\frac{b-\mu}{\sigma}\right) - \Phi\left(\frac{a-\mu}{\sigma}\right)$

(c) $\Phi\left(\frac{a+\mu}{\sigma}\right) - \Phi\left(\frac{b+\mu}{\sigma}\right)$

(d) $\Phi\left(\frac{b+\mu}{\sigma}\right) - \Phi\left(\frac{a+\mu}{\sigma}\right)$

56. Let $(X_1, X_2, \ldots, X_{53})$ be a random sample from N(0, 1) distribution. If for some α's, β's and γ's, $\sum_{i=1}^{53} \alpha_i X_i = 0$, $\sum_{i=1}^{53} \beta_i X_i = 0$ and $\sum_{i=1}^{53} \gamma_i X_i = 0$, then the distribution of $\sum_{i=1}^{53} X_i^2$, is :

(a) χ^2_{52}

(b) χ^2_{50}

(c) χ^2_{49}

(d) χ^2_{53}

57. Let M be the minimum observation in a random sample of size n from a distribution that has the pdf $f(x) = \begin{cases} e^{-(x-\theta)}, & \theta < x < \infty \\ 0, & \text{otherwise} \end{cases}$

What is the distribution of $2n(M - \theta)$?

(a) $\chi^2_{(2n)}$

(b) Exponential distribution with mean equal to 2

(c) Exponential distribution with mean equal to 0·5

(d) $\chi^2_{(n)}$

58. Let $X \sim N(\mu, \sigma^2)$. If $\sigma^2 = \mu^2$, $\mu > 0$, then the expression of $P[(X < -\mu) \mid (X < \mu)]$ in terms of the cdf of N(0, 1) distribution $\Phi(.)$ is :

(a) $\Phi(-2)$

(b) $\Phi(2)$

(c) $1 - \Phi(2)$

(d) $2[1 - \Phi(2)]$

59. Suppose that the random variables X_1, X_2, X_3, X_4, X_5 are independent and each has a standard normal distribution. A constant C such that the random variable $\frac{C(X_4 + X_5)}{(X_1^2 + X_2^2 + X_3^2)^{\frac{1}{2}}}$ will have a t-distribution, has value :

(a) $\sqrt{\frac{3}{2}}$

(b) $\frac{\sqrt{3}}{2}$

(c) $\frac{3}{2}$

(d) $\sqrt{\frac{2}{3}}$

60. Consider the following 2 × 2 table for two attributes A and B :

	B	not B
A	a	b
not A	c	d

Given that Q = Yule's Coefficient of Association and Y = Coefficient of Colligation.

Which of the following statements are correct ?

I. Q = Y = 1 if bc = 0

II. Q = – 1 if ad = 0

III. Q = 0 if ad = bc

Select the answer using the code given below :

(a) I and II only

(b) II and III only

(c) I and III only

(d) I, II and III

61. What is the function whose first difference is $3x^2 + x + 4$?

(take interval of differencing to be unity)

(a) $4x^2 + 7x + \lambda$

(b) $2x^3 + x^2 + \lambda$

(c) $2x^3 + x^2 + 8x + \lambda$

(d) $x^3 - x^2 + 4x + \lambda$

62. What is forward difference approximation for the second order derivative $f''(x_i)$ at x_i ?

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

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

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

(d) $\frac{f_{i+3} - 2f_{i+2} - f_{i+1}}{h^2}$

63. Suppose g is function such that $y = f(x) \Leftrightarrow x = g(y)$ and f(x) is given by $f(x) = \frac{(x-b)(x-c)}{(a-b)(a-c)}\alpha + \frac{(x-a)(x-c)}{(b-a)(b-c)}\beta + \frac{(x-a)(x-b)}{(c-a)(c-b)}\gamma$ where $a < b < c$ and $\alpha < \beta < \gamma$ are real numbers. What is $g(\beta)$ equal to ?

(a) β

(b) a

(c) b

(d) α

64. Suppose $f(x) = x + x^3 + x^5$. If g(x) is a quadratic polynomial determined using Lagrange's interpolation formula using the fact that $g(f(0)) = 0$, $g(f(1)) = 1$ and $g(f(2)) = 2$, then what is g(13) equal to ?

(a) 70/19

(b) 71/21

(c) 71/20

(d) 70/21

65. If $y_4(x)$ is the 4^{th} iterate of Picard's approximation for the solution of the initial value problem $\frac{dy}{dx} = 1 + x^2 + y^2$; $y(1) = 2$, then what is $y_4(1)$ equal to ?

(a) 1

(b) 2

(c) 3

(d) 4

66. Consider the following statements in respect of forward and backward operators (Δ and ∇) :

I. $\Delta - \nabla = \Delta\nabla$

II. $\nabla - \Delta = \nabla\Delta$

III. $\Delta + \nabla = \Delta\nabla$

IV. $\Delta + \nabla = -\Delta\Delta$

Which of the statements given above is/are correct ?

(a) I only

(b) II only

(c) I and III

(d) II and IV

67. What is the value of $\frac{\Delta^{100}}{E}(x^{100})$?

(take interval of differencing to be unity)

(a) 100!

(b) 100! – 99!

(c) 100! – 1

(d) 100! – 99! + 1

68. Consider the following data :

x	6·1	6·2	6·3	6·4
f(x)	– 0·1998	– 0·2223	– 0·2422	– 0·2596

What is the approximate value of f″(6·3) with error $O(h^2)$ obtained using central difference operator ?

(a) 0·27

(b) 0·25

(c) 0·23

(d) 0·21

69. What is the approximate value of the integral $\int_0^1 x^3\,dx$, if it is obtained using the quadrature formula $\int_0^1 f(x)\,dx = \alpha f(0) + \beta f(x_1)$ which is exact for polynomials of all small degrees as high as possible ?

(a) 1/4

(b) 1/9

(c) 2/3

(d) 2/9

70. It is given that f(0) = 8, f(1) = 11, f(4) = 68 and f(5) = 120. What is the approximate value of f(2) if it is obtained by applying Lagrange's interpolation formula ?

(a) 16·6

(b) 17·6

(c) 18·6

(d) 19·6

71. Which one of the following statements best describes the use of flowcharts in problem solving ?

(a) Flowcharts are used to visualize data structure.

(b) Flowcharts are used to create graphical user interface.

(c) Flowcharts consist of short, readable and formally-styled English language statements.

(d) Flowcharts are diagrammatic representations of the logic for solving a task.

72. What is the main purpose of the linker in the compilation process of the programming languages ?

(a) To perform optimization of compiled code

(b) To translate source code into machine code

(c) To check syntax of the program

(d) To combine object files and libraries into an executable program

73. Which of the following are the characteristics of virtual reality ?

I. It is created using multimedia.

II. It enables users to move and react in a computer-simulated environment.

III. It stimulates senses like sight, hearing, and touch.

Select the answer using the code given below :

(a) I and II only

(b) II and III only

(c) I and III only

(d) I, II and III

74. Multimedia refers to combination of different types of media in one application. How many of the following are part of multimedia ?

I. Text
II. Video
III. Audio
IV. Graphics and Images
V. Animation

Select the answer using the code given below :

(a) Only two
(b) Only three
(c) Only four
(d) All five

75. Consider the following in respect of working of router in computer networks ?

I. It is used for the purpose of interconnecting computer networks.
II. It determines on which outgoing link an IP packet is to be forwarded.
III. The destination address of the IP packet is examined, and it is routed to the next router.

Which of the statements given above are correct ?

(a) I and II only
(b) II and III only
(c) I and III only
(d) I, II and III

76. In which one of the following the same set of statements are executed several times on the basis of the condition specified ?

(a) If - Then
(b) If - Then - Else
(c) Do - While
(d) Case Type

77. Consider the following statements about the virtual memory in the computer system :

I. It provides large addressable space without worrying about size limitations of physical memory.
II. It provides efficient sharing of main memory among different users in multiprogrammed operating system.
III. It provides a large secondary memory.

Which of the statements given above are correct ?

(a) I and II only
(b) II and III only
(c) I and III only
(d) I, II and III

78. A packet filter firewall can :

(a) filter the specific users from accessing the services of the network.
(b) block all IP packets from entering the networks.
(c) check all IP packets and if found valid, then it is allowed to enter or exit the networks.
(d) block any kind of viruses from entering the networks.

79. A Wi-Fi is often used as a synonym for which IEEE technology ?

(a) 802·1
(b) 802·5
(c) 802·9
(d) 802·11

80. AND and OR operations are part of which unit of CPU ?

(a) Arithmetic Unit
(b) Logic Unit
(c) Control Unit
(d) Main Memory Unit

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