

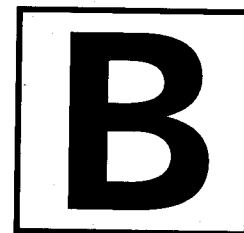
DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

T.B.C. : DFSE-U-STT

Test Booklet Series

Serial

1010818



# 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. The value of the Kolmogorov-Smirnov statistic to test whether the observations 0.32, 0.16, 0.98, 0.16 and 0.08 arise from a  $U(0, 2)$  population is
- 0.16
  - 0.52
  - 0.64
  - 0.76

2. Given the following contingency table :

Material Number	A	B	C	D	E	Total
Leaked	36	22	$X_1$	$X_2$	42	200
Not leaked	90	Y	46	78	168	400

It is known that column total for material C and D are same. Then values of  $X_1$ ,  $X_2$  and Y are respectively

- 66, 34, 18
  - 34, 66, 18
  - 70, 30, 20
  - 30, 70, 20
3. In a clinical trial, n randomly chosen persons were enrolled to examine whether two different skin creams, A and B, have different effects on the human body. Cream A was applied to one of the randomly chosen arms of each person, cream B to the other arm. Which statistical test is to be used to examine the difference ?
- [Assume that the response measured is a continuous variable]
- Two-sample Kolmogorov – Smirnov test
  - Two-sample t-test if normality can be assumed
  - Paired t-test if normality can be assumed
  - Test for randomness

4. If  $X \sim F(5, 10)$ , then consider the following statements :

- $E(X) > 1$
- Mode of  $X > 1$

Which of the above results is/are correct ?

- 1 only
- 2 only
- Both 1 and 2
- Neither 1 nor 2

5. In 30 tosses of a coin, the following sequence of heads (H) and tails (T) is obtained as H T T H T H H H T H H T T H T H T H H T T H T H T. The number of runs is

- 30
- 22
- 20
- 28

6. A manufacturer claims that the lifetime of its product is more than 250 hours. To verify its claim based on 24 randomly observed lifetimes, which one of the following tests can be used ?

- Sign test
- Mann – Whitney U test
- Median test
- Kolmogorov – Smirnov test

7. If  $X_{(r)}$  is the  $r^{\text{th}}$  order statistic in a random sample of size n from a distribution with c.d.f.  $F(x)$  which is continuous, then  $F(X_{(r)})$  is the  $r^{\text{th}}$  order statistic in a random sample of size n from the

- Uniform distribution over  $(-1, +1)$
- Uniform distribution over  $(0, 1)$
- Normal distribution
- Exponential distribution

8. Let  $r_{ij}$  denote the correlation coefficient between  $X_i$  and  $X_j$  variables. If  $r_{12} = \sin^2 \theta$ ,  $r_{13} = \cos \theta$ ,  $r_{23} = \sin \theta$ , where  $-\pi \leq \theta \leq \pi$ , then the partial correlation coefficient  $r_{12.3}$  is

- (a)  $2 \operatorname{cosec} 2\theta$
- (b)  $-2 \operatorname{cosec} 2\theta$
- (c)  $\tan \theta - 1$
- (d)  $2 \cot 2\theta$

9. When two judges rank two individuals only, Spearman's rank correlation coefficient can assume the values

- (a)  $-1$  and  $0$  only
- (b)  $-1$  and  $1$  only
- (c)  $0$  and  $1$  only
- (d)  $-1, 0$  and  $1$

10. Let  $X_1, X_2, X_3, X_4$  and  $X_5$  be five independent observations drawn from a continuous distribution with distribution function  $F(x)$  and probability density function  $f(x)$ . What is the probability density function of the sample median?

- (a)  $5[F(x)]^4 f(x)$
- (b)  $5[1 - F(x)]^4 f(x)$
- (c)  $5[1 - F(x)]^2 [F(x)]^2 f(x)$
- (d)  $30[1 - F(x)]^2 [F(x)]^2 f(x)$

11. Consider the following statements :

- 1. If the original scores in a sample are multiplied by a constant, then mean and standard deviation are also multiplied by the same constant.
- 2. If the original scores in a sample are multiplied by a constant, then standard deviation is multiplied by the absolute constant.
- 3. If a constant number is added to each of the original scores then the new standard deviation remains unchanged.

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

12. In the usual notations for attributes, consider the following relations :

- 1.  $(AB) > (A)$
- 2.  $(AB) < (A) + (B) - N$
- 3.  $(ABC) > (AB) + (AC) + (BC) - (A) - (B) - (C) + N$

Which of the above relations are correct for the inconsistency of data?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

13. If  $D = X - Y$  and  $S_D^2 = S_X^2 + S_Y^2$ , then the correlation coefficient  $r$  between  $X$  and  $Y$  is

- (a) greater than zero but not equal to one
- (b) less than zero
- (c) equal to zero
- (d) equal to one

14. Let  $X$  be a random variable with finite variance  $\sigma^2$ . If  $Y = 20 - X$ , then the coefficient of correlation between  $X$  and  $(X + Y)X$  will be

- (a)  $-1$
- (b)  $0$
- (c)  $1/20$
- (d)  $1$

15. If the coefficient of correlation in a bivariate set-up is noted to be 0.7, then which of the following statements is/are correct ?

1. The percentage of variation in the dependent variable explained by the independent variable is 49.
2. Both the regression coefficients have positive sign.
3. Both the regression coefficients have negative sign.

Select the correct answer using the code given below :

- (a) 1 only
  - (b) 1 and 2
  - (c) 1 and 3
  - (d) 2 only
16. In a trivariate distribution if  $r_{12} = r_{23} = r_{31} = \rho \neq 1$ , then the value of  $R_{1,23}$  is

- (a)  $\frac{\rho}{\sqrt{1+\rho}}$
- (b)  $\frac{1}{\sqrt{1+\rho}}$
- (c)  $\frac{1}{1+\rho}$
- (d)  $\frac{\sqrt{2}\rho}{\sqrt{1+\rho}}$

17. Let X and Y be independent standard normal random variables. Then the distribution of

$$U = \left( \frac{X - Y}{X + Y} \right)^2 \text{ is}$$

- (a) Chi-square with 2 degrees of freedom
- (b) Chi-square with 1 degree of freedom
- (c) F with (2, 2) degrees of freedom
- (d) F with (1, 1) degrees of freedom

18. The degrees of freedom of the F-statistic to test for equality of the variances of two normal populations with unknown means, when independent samples of sizes 20 and 37 are respectively given from the two, are

- (a) 18 and 35
- (b) 19 and 36
- (c) 20 and 37
- (d) 21 and 38

19. To test whether the upper 60<sup>th</sup> percentile of a continuous distribution equals 25 or less, the sign test is applied based on a random sample of size 10 and the null hypothesis is rejected if the number of observations larger than 25 is 7 or more. The size of the test, given that  $(0.6)^7 \approx 0.028$ , is approximately

- (a) 0.04
- (b) 0.05
- (c) 0.10
- (d) 0.38

20. Ten (10) runners in a race each has finishing time uniformly distributed in the interval (10, 11) in seconds, independently of each other. The expected time of the winner is

- (a)  $10\frac{1}{11}$  seconds
- (b)  $10\frac{1}{10}$  seconds
- (c)  $10\frac{1}{9}$  seconds
- (d)  $10\frac{1}{2}$  seconds

21. Consider the following statements :

1. If ordered samples of size  $r$  are drawn from a population of  $n$  elements, then there are  $n(n-1)(n-2)\dots(n-r+1)$  samples without replacement.
2. If  $n$  distinguishable balls are to be randomly placed in  $n$  cells, then the probability that each cell will be occupied is 1.

Which of the above statements is/are correct ?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

22. A die is loaded in such a way that each odd number is twice as likely to occur as each even number. Let  $A$  be the event that the number rolled is greater than 3 and  $B$  be the event that the number rolled is a perfect square. Which of the following results is/are correct ?

1.  $P(B) = 1/3$
2.  $P(B|A) = 1/2$

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

23. If  $p(x) = kp^x$ , where  $0 < p < 1$  and  $x = 0, 2, 4, 6, \dots$ , then what is the value of  $k$  for which  $p(x)$  is a probability mass function ?

- (a)  $1-p$
- (b)  $p$
- (c)  $1-p^2$
- (d)  $p^2$

24. Two independent random variables  $X$  and  $Y$  are both normally distributed with means 1 and 2 and standard deviations 3 and 4 respectively. If  $Z = X - Y$ , then consider the following statements :

1. Median and standard deviation of  $Z$  are -1 and 5 respectively
2.  $P(Z + 1 < 0) = 0.5$

Which of the above statements is/are correct ?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

25. The distributions possessing the lack of memory property are

- (a) Gamma distribution and Beta distribution
- (b) Beta distribution and Geometric distribution
- (c) Geometric distribution and Exponential distribution
- (d) Exponential distribution and Cauchy distribution

26. The random variables  $X$  and  $Y$  have the joint distribution given by the p.d.f.

$$f(x, y) = \begin{cases} 6(1-x-y), & \text{for } x > 0, y > 0, x+y < 1 \\ 0, & \text{otherwise} \end{cases}$$

What is  $P(X \geq 0.4)$  equal to ?

- (a) 0.21
- (b) 0.25
- (c) 0.31
- (d) 0.35

27. The mean of the probability density function

$$f(x) = \begin{cases} 12x^2(1-x), & \text{for } 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases} \text{ is}$$

- (a) 0.5
- (b) 0.6
- (c) 0.7
- (d) 0.8

28. A random variable  $Y$  has the probability density function

$$f(y) = \begin{cases} e^y, & \text{if } y < 0 \\ 0, & \text{otherwise} \end{cases}$$

The moment generating function  $M_Y(t)$  of  $Y$  is

- (a)  $M_Y(t) = \frac{1}{1-t}$  for  $t < 1$
- (b)  $M_Y(t) = \frac{1}{1-|t|}$  for all  $t$
- (c)  $M_Y(t) = \frac{1}{1+t}$  for all  $t > -1$
- (d)  $M_Y(t) = \frac{1}{1+|t|}$  for all  $t$
29. Let  $X$  be a non-negative random variable with finite, non-zero expectation  $\mu$ . Which one of the following statements is correct for every  $t > 0$ ?
- (a)  $P(X \geq t\mu) \geq 1/(t\mu)$
- (b)  $P(X \geq t\mu) \leq 1/t$
- (c)  $P(X \leq t\mu) \leq 1/(t\mu)$
- (d)  $P(X \leq t\mu) \geq 1/t$
30. Consider two events  $A$  and  $B$  such that  $P(A) = 1/4$ ,  $P(B|A) = 1/2$  and  $P(A|B) = 1/4$ . Define random variable  $X$  as  $X = 1$  if event  $A$  occurs and 0 if event  $A$  does not occur. Define random variable  $Y$  as  $Y = 1$  if event  $B$  occurs and 0 if event  $B$  does not occur. Then consider the following statements :
- $P(X^2 + Y^2 = 1) = 1/4$
  - $P(XY = X^2Y^2) = 1$
- Which of the above statements is/are correct ?
- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

31. A bivariate normal random vector  $(X, Y)$  with  $V(X) = 2$ ,  $V(Y) = 3$ ,  $\text{Cov}(X, Y) = \alpha$  does **not** possess a density function. Then

- (a)  $\alpha = 0$
- (b)  $\alpha = \pm \sqrt{6}$
- (c)  $|\alpha| < \sqrt{6}$
- (d)  $|\alpha| > 6$

32. Suppose  $U \sim U(0, 1)$ . Then the sequence

$$X_n = \begin{cases} \sqrt{n} & \text{if } 0 < U < \frac{1}{n^2}, n \geq 1, \\ 0, & \text{otherwise} \end{cases}$$

converges

- (a) both with probability one and in mean square
- (b) with probability one but not in mean square
- (c) in mean square but not with probability one
- (d) neither with probability one nor in mean square
33. The function
- $$F(x) = \begin{cases} 0, & x < 0 \\ \frac{x}{2}, & 0 \leq x < 1 \\ (1-\alpha)x + 2\alpha - 1, & 1 \leq x < 2 \\ 1, & x \geq 2 \end{cases}$$
- is a distribution function if and only if
- (a)  $0 < \alpha < \frac{1}{2}$
- (b)  $\frac{1}{2} \leq \alpha \leq 1$
- (c)  $0 \leq \alpha \leq 1$
- (d)  $\alpha = \frac{1}{2}$
34. The maximum possible probability an exponential distribution with an arbitrary parameter can give to the interval  $[3, 6]$  is
- (a)  $\frac{1}{2}$
- (b)  $\frac{1}{3}$
- (c)  $\frac{1}{4}$
- (d)  $\frac{2}{3}$

35. If the probability generating function of a Poisson distribution has the value  $e^{-1}$  at  $\frac{2}{3}$ , then the mean of the distribution is

- (a)  $e^{-\frac{2}{3}}$   
 (b)  $\frac{2}{3}$   
 (c)  $\frac{3}{2}$   
 (d) 3

36. The function

$$F(x) = \begin{cases} 0, & x < 0 \\ \frac{x}{3}, & 0 \leq x < 2 \\ (1 - \alpha)x + 3\alpha - 2, & 2 \leq x < 3 \\ 1, & x \geq 3 \end{cases}$$

is the distribution function of a continuous random variable

- (a) for all  $\alpha \in (0, 1)$   
 (b) for all  $\alpha \in \left(\frac{2}{3}, 1\right)$   
 (c) for all  $\alpha \in \left[\frac{2}{3}, 1\right]$   
 (d) if and only if  $\alpha = \frac{2}{3}$

37. The function

$$F(x, y) = \begin{cases} \alpha & \text{if } x, y > 0; x + y < 1 \\ 1 & \text{if } x, y > 0; x + y \geq 1 \\ 0 & \text{otherwise} \end{cases}$$

is the cumulative distribution function of a random vector  $(X, Y)$

- (a) for no real value of  $\alpha$   
 (b) if and only if  $0 < \alpha < 1$   
 (c) if and only if  $0 \leq \alpha < 1$   
 (d) if and only if  $0 < \alpha \leq 1$

38. If the random vector  $(X, Y, Z)$  has density  $f$  on  $\mathbb{R}^3$ , then the random vector  $\left(\frac{X+Y}{2}, \frac{Y+Z}{2}, \frac{Z+X}{2}\right)$  has density given by

- (a)  $g(u, v, w) = f(u - v + w, u + v - w, -u + v + w)$   
 (b)  $g(u, v, w) = 4f(u - v + w, u + v - w, -u + v + w)$   
 (c)  $g(u, v, w) = 4f\left(\frac{u - v + w}{2}, \frac{u + v - w}{2}, \frac{-u + v + w}{2}\right)$   
 (d)  $g(u, v, w) = 8f\left(\frac{u - v + w}{2}, \frac{u + v - w}{2}, \frac{-u + v + w}{2}\right)$

39. If  $X$  has binomial distribution with  $n = 3$  and  $p = \frac{1}{3}$ , then what is the value of  $E\left(\frac{X}{X+1}\right)$ ?

- (a)  $\frac{43}{108}$   
 (b)  $\frac{5}{12}$   
 (c)  $\frac{47}{108}$   
 (d)  $\frac{49}{108}$

40. A company produces light bulbs at three factories A, B and C. Factory A produces 40% of the total number of bulbs, of which 2% are defective. Factory B produces 35% of the total number of bulbs, of which 4% are defective. Factory C produces 25% of the total number of bulbs, of which 3% are defective. If a defective bulb is found among the total output, then what is the probability that it was from factory A?

- (a) 0.20  
 (b) 0.25  
 (c) 0.27  
 (d) 0.47

41. Which of the following devices are paired together to form a terminal ?  
(a) Keyboard and display monitor  
(b) Keyboard and printer  
(c) Printer and display monitor  
(d) Projector and printer
42. Which of the following statements are correct in respect of an expression ?  
1. The operators '+' and '-' must be followed by an operand.  
2. Two arithmetic operators must not appear side by side.  
3. The number of left hand brackets must be equal to the number of right hand brackets in expression.  
Select the correct answer using the code given below :  
(a) 1 and 3 only  
(b) 1 and 2 only  
(c) 2 and 3 only  
(d) 1, 2 and 3
43. Which of the following are weighted codes ?  
1. BCD code  
2. GRAY code  
3. ASCII code  
4. 8421 code  
Select the correct answer using the code given below :  
(a) 1 and 3 only  
(b) 1 and 4 only  
(c) 3 and 4 only  
(d) 2 and 3 only
44. Which of the following is **not** an application layer protocol ?  
(a) ARP  
(b) FTP  
(c) DNS  
(d) SNMP
45. Which is the most popular method used to represent negative numbers in the computer system ?  
(a) One's complement  
(b) Signed magnitude  
(c) Two's complement  
(d) Floating-point system
46. Which of the following are the optical character recognition devices ?  
1. OCR  
2. OMR  
3. MICR  
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
47. Which language was designed with an aim to work with Microsoft's .NET platform ?  
(a) Python  
(b) Visual Basic  
(c) Java  
(d) C#
48. What is the main function of an input device in a computer ?  
(a) Receiving data from a computer  
(b) Providing data to a computer  
(c) Storing data for processing  
(d) Processing the data
49. Consider the following components :  
1. Electron gun  
2. Electromagnetic coils  
3. Screen  
Which of the above are internal components of Cathode Ray Tube Monitor ?  
(a) 1 and 2 only  
(b) 2 and 3 only  
(c) 1 and 3 only  
(d) 1, 2 and 3
50. In hexadecimal system, the binary number  $(111110111.110101)_2$  is equivalent to  
(a)  $(2F7.C4)_{16}$   
(b)  $(1F7.D5)_{16}$   
(c)  $(1F7.D4)_{16}$   
(d)  $(2F7.D4)_{16}$



51. Which one of the following decimal numbers corresponds to 8421 BCD code representation 010100100001.0110 ?
- (a) 573.4
  - (b) 531.6
  - (c) 521.6
  - (d) 421.6
52. What technology is used to hide information inside a picture ?
- (a) Root kits
  - (b) Bit mapping
  - (c) Steganography
  - (d) Image rendering
53. Which one of the following is *not* a web browser ?
- (a) Google Chrome
  - (b) Microsoft Internet Explorer
  - (c) Apple iOS
  - (d) Mozilla Firefox
54. Programs stored in which one of the following memories can *not* be erased ?
- (a) RAM
  - (b) ROM
  - (c) Virtual memory
  - (d) Cache memory
55. One Giga Byte (GB) memory is equal to
- (a)  $1024 \times 1024$  Mega Bytes
  - (b)  $1024 \times 1024$  Tera Bytes
  - (c)  $1024 \times 1024$  Bytes
  - (d)  $1024 \times 1024$  Kilo Bytes
56. ISO 27001 is a specification/standard for
- (a) Quality Management
  - (b) Information Security Management
  - (c) Environmental Management
  - (d) Health Management
57. Which one of the following is the wireless technology standard ?
- (a) IEEE 803.11b
  - (b) IEEE 803.11e
  - (c) IEEE 801.11c
  - (d) IEEE 802.11b
58. A sequential electronic circuit that is used to store 1 bit of information is called
- (a) Register
  - (b) Flip-flop
  - (c) Counter
  - (d) Semiconductor
59. Which one of the following is *not* a valid hexadecimal number ?
- (a) 12345
  - (b) 1AB9F
  - (c) 15F6G
  - (d) 1A3BC
60. Which one of the following is used to store data permanently ?
- (a) Primary memory
  - (b) Secondary memory
  - (c) Cache memory
  - (d) Register

61. Suppose we apply some formula to find an interpolation value. Later on, if another interpolation value was inserted, then which method is better to handle without recalculating the whole formula ?

- (a) Lagrange's formula
- (b) Newton's forward formula
- (c) Newton's divided difference formula
- (d) All methods are same

62. In order to solve the integral  $\int_0^1 (1+x) dx$  using numerical integration, which one of the following methods is better to apply ?

- (a) Trapezoidal rule
- (b) Simpson's one-third rule
- (c) Simpson's three-eighth rule
- (d) Weddle's rule

63. What is  $\delta^2 y_5$  equal to ?  
( $\delta$  is the central difference operator)

- (a)  $y_6 - y_5 + y_4$
- (b)  $y_6 - 2y_5 + y_4$
- (c)  $y_6 + y_5$
- (d)  $y_6 - 4y_2 + y_3$

64. Suppose  $y(x)$  is the solution of the initial value problem  $\frac{dy}{dx} = x + y$ ,  $y(0) = 0$ . Euler's method is used to estimate  $y(0.5)$  in five steps. Then the estimated value of  $y(0.5)$  belongs to

- (a) (0, 0.1)
- (b) (0.1, 0.2)
- (c) (0.2, 0.3)
- (d) (0.3, 0.4)

65. Consider the following statements :

1. The divided differences are symmetrical in their arguments.
2. The  $n^{\text{th}}$  divided differences of a polynomial of  $n^{\text{th}}$  degree are constant.
3. The divided difference operator is linear.

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

66. If  $\delta$  and  $\mu$  are central difference and average operators respectively, then  $\mu\delta$  is equal to

- (a)  $\frac{1}{2}(\Delta + \nabla)$
- (b)  $\frac{1}{2}(\Delta - \nabla)$
- (c)  $(\Delta + \nabla)$
- (d)  $(\Delta - \nabla)$

67. What is  $\frac{1}{(E^2 - 9E + 18)} (12 \times 5^x)$  equal to ?

(Take interval of differencing to be unity)

- (a)  $-6 \times 5^x$
- (b)  $6 \times 5^x$
- (c)  $-6^{-1} \times 5^x$
- (d)  $6^{-1} \times 5^x$

68. The value of  $(3x + 8)^{(4)}$  at  $x = 2$  is given by

- (a) 6160
- (b) 12320
- (c) 13440
- (d) 24024

69. Consider the following values of  $x$  and  $f(x)$  :

$x$	1	6	9	11
$f(x)$	12	13	14	16

The approximate value of  $x$  for which  $f(x) = 15$  is

- (a) 9.5
- (b) 10
- (c) 10.5
- (d) 10.9

70. What is the function whose first difference is  $9x^2 + 11x + 5$ , with  $h = 1$  ?

- (a)  $x^3 + x^2 + x + c$
- (b)  $x^3 + 2x^2 + 2x + c$
- (c)  $3x^3 + x^2 + 2x + c$
- (d)  $3x^3 + x^2 + x + c$

71. The polynomial of the lowest possible degree (using Newton's divided difference formula), which assumes the values 3, 12, 15 and -21, when  $x$  has the values 3, 2, 1 and -1 respectively, is

- (a)  $27x^3 + 2x^2 - 4x$
- (b)  $x^3 + 2x^2 - 5x - 27$
- (c)  $x^3 - 9x^2 + 17x + 6$
- (d)  $x^3 + 2x^2 - 5x + 17$

72. For the following values of divided difference  $f[4] = 48$ ,  $f[4, 5] = 52$ ,  $f[4, 5, 7] = 15$  and  $f[4, 5, 7, 10] = 1$ . What is the value of  $f(8)$  ?

- (a) 148
- (b) 248
- (c) 348
- (d) 448

73. Let

$$A = \int_0^{10} x^2 dx.$$

The value of the integral is computed by Simpson's one-third rule by dividing  $[0, 10]$  into 10 equal subdivisions. If  $B$  is the value of the integral thus computed, then  $|A - B|$

- (a) is greater than 10
- (b) belongs to  $(5, 10)$
- (c) belongs to  $(0, 5)$
- (d) is 0

74. Given  $f(20) = 512$ ,  $f(30) = 439$ ,  $f(40) = 346$ ,  $f(50) = 243$ .

Consider the following statements :

1. The function  $f(x)$  can be approximated by a polynomial of degree  $n$  where  $n < 2$ .
2. The approximate value of  $f(x)$  for  $x = 10$  and  $x = 60$  can be obtained by Newton Gregory forward difference and Newton Gregory backward difference interpolation formulae respectively.

Which of the above statements is/are correct ?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

75. Which one of the following is correct ?

- (a)  $\Delta \nabla \neq \nabla \Delta$
- (b)  $\Delta E \neq E \Delta$
- (c)  $\Delta - E \neq I$
- (d)  $E - \Delta \neq I$

76. The integral  $\int_0^1 (3x^2 + 25) dx$  is evaluated by

Simpson's one-third rule with  $h = 1/4$ . The value of the integral so obtained is

- (a) 23
- (b) 24.56
- (c) 25.33
- (d) 26

77. A numerical integration formula is written as  $\int_{-1}^1 f(x) dx = \frac{1}{2} \left[ f(-1) + cf \left( \frac{1}{3} \right) \right]$ ,

The value of  $c$  such that the method is of highest possible order is

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

78. The unique polynomial  $p(x)$  of degree 2 such that  $p(1) = 1$ ,  $p(3) = 27$ ,  $p(4) = 64$  obtained by using Newton's divided difference formula is

- (a)  $8x^2 - 12x + 19$
- (b)  $8x^2 - 19x + 12$
- (c)  $12x^2 - 8x - 19$
- (d)  $12x^2 - 19x + 8$

79. A curve is drawn to pass through the points given in the following table :

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

The area bounded by the curve, the x-axis and the lines  $x = 1$  and  $x = 4$  obtained by using Simpson's one-third rule is

- (a) 7.81
- (b) 7.78
- (c) 7.74
- (d) 7.72

80. If  $y = a(3)^x + b(-2)^x$  with increment  $h = 1$ , then  $(\Delta^2 + \Delta - 6)y$  is equal to

- (a) 1
- (b) 0
- (c)  $2x$
- (d)  $4x$

## SPACE FOR ROUGH WORK

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