



Booklet Series

E

05/EFC/M-2025-01(E)

Question Booklet

PAPER - I

Booklet Serial No.

1104633

Candidate's Roll Number

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Time Allowed : 2 Hours

Maximum Marks : 100

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. This Question Booklet contains 100 questions in all.
2. All questions carry equal marks.
3. An Answer Sheet has been supplied inside the question booklet to mark the answers. You must write your Roll Number and encode it and write other particulars in the space provided in the Answer Sheet, failing which your Answer Sheet will not be evaluated.
4. Immediately after commencement of the examination, you should check up your Question Booklet and attached answer sheet and ensure that the Question Booklet Series is printed on the top left-hand corner of the Booklet and the series encoded in answer sheet are same. Also please check that the Booklet contains 20 printed pages including two pages (Page Nos. 19 and 20) for Rough Work and no page or question is missing or unprinted or torn or repeated or question booklet and answer sheet have different series. If you find any defect in this Booklet and attached answer sheet, get it replaced immediately by a complete Booklet with OMR sheet of the same series.
5. You must write your Roll Number in the space provided on the top of this page. Do not write anything else on the Question Booklet.
6. Questions and their responses are printed in English version in this Booklet. Each question comprises of four responses – (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark it in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case choose ONLY ONE response for each question.
7. In the Answer Sheet, there are four circles – (A), (B), (C) and (D) against each question. To answer the questions, you are to mark with Black/Blue ink ballpoint pen ONLY ONE circle of your choice for each question. Select only one response for each question and mark it in your Answer Sheet. If you mark more than one circle for one question, the answer will be treated as wrong. Use Black/Blue ink ballpoint pen only to mark the answer in the Answer Sheet. Any erasure or change is not allowed.
8. For each question for which a wrong answer/more than one answer has been given by the candidates, one third (1/3) of the marks assigned to that question will be deducted as penalty.
9. You should not remove or tear off any sheet from the Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. After the examination has concluded, you must hand over your Answer Sheet to the Invigilator. Thereafter, you are permitted to take away the Question Booklet with you.
10. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.
11. Candidates must assure before leaving the Examination Hall that their Answer Sheets will be kept in Self Adhesive LDPE Bag and completely packed/sealed in their presence.



Booklet Series No.

1104633

05/EFC/M-2025-01(E)

Booklet Series

Candidate's Roll Number

Question Booklet



PAR-1

Maximum Marks: 100

Time Allowed: 2 Hours

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. The question booklet contains 100 questions. All answers carry equal marks.
2. An answer sheet has been supplied inside the question booklet to mark the answers. You must write your Roll Number and I number at and write other particulars in the space provided in the answer sheet, filling within our Area of sheet will not be awarded.
3. Immediately after commencement of the examination, you should check in your question booklet and attached answer sheet and ensure that the Question Booklet folder is placed on the top left-hand corner of the Booklet and answer sheet is placed on the top right-hand corner of the Booklet and the pages including two pages of the Booklet for Rough Work and no page of question booklet is missing or torn or overexposed or question booklet and answer sheet have any fault cases. If you find any defect in the Booklet and attached answer sheet, get it replaced immediately by a separate Booklet and answer sheet of the same series.
4. You must write your Roll Number in the space provided in the top of the page. Do not write anything else on the Question Booklet.
5. Questions and their responses are printed in a single column in the Booklet. Each question consists of four responses - (A), (B), (C) and (D). You are to mark ONLY ONE correct response and mark it in your Answer Sheet. In case you feel that there are more than one correct responses, mark the response which you consider the best. In any case, choose ONLY one response for each question.
6. In the answer sheet, there are four circles (A), (B), (C) and (D) against each question. You must mark the correct response in the answer sheet. You are to mark with Black Ballpoint pen ONLY ONE circle of your choice for each question. Mark only one circle for each question. The answer sheet will be treated as invalid if you mark more than one circle for any question. The answer sheet, the question or the response is not ballpoint pen only to mark the answer in the answer sheet. The question or the response is not allowed.
7. For each question, you will be given four responses. You are to mark the correct response in the answer sheet. If you mark more than one circle, the answer will be treated as invalid. The answer sheet will be treated as invalid if you mark more than one circle for any question. The answer sheet, the question or the response is not allowed.
8. You should not remove or tear off any sheet from the question booklet. You are not allowed to take the question booklet and the answer sheet out of the examination hall during the examination. After the examination has concluded, you must hand over your answer sheet to the invigilator. Thereafter, you are to be treated as a candidate who has not appeared for the examination.
9. If you do comply with any of the above instructions, you will render you ineligible for the award of prize or scholarship.
10. Candidates must receive before leaving the examination hall that their answer sheets will be sent to Ball Depository for tagging and recording. Candidates should not tamper with their answer sheets.
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Directions (Q.No. 1 to 3) : Given below are sentences with a misplaced modifier. Select the correct sentence from given options.

1. She almost needed one day to complete the assignment.
 - (A) She needed almost one day to complete the assignment.
 - (B) She almost needed one day to complete the assignment.
 - (C) Almost she needed one day to complete the assignment.
 - (D) She needed one day almost to complete the assignment.

2. The cat should be treated by a veterinarian that has worms.
 - (A) The cat should be treated by a veterinarian that has worms.
 - (B) The veterinarian that has worms should treat the cat.
 - (C) The cat should be treated by a veterinarian who has worms.
 - (D) The cat that has worms should be treated by a veterinarian.

3. Walking through the museum, the ancient sculptures fascinated the visitors.
 - (A) Walking through the museum, the ancient sculptures fascinated the visitors.
 - (B) The ancient sculptures fascinated the visitors walking through the museum.
 - (C) The visitors walking through the museum were fascinated by the ancient sculptures.
 - (D) Walking through the museum, the ancient sculptures amazed the visitors.

Directions (Q.No. 4 to 6) : Read each set of statements carefully and determine which conclusions logically follow. Select the correct option based only on the information given.

4. Statements: All cats are dogs. All dogs are brown.
Conclusions:
I. All cats are brown.
II. Only dogs are brown.
III. All dogs are cats.
(A) Only I
(B) Only II
(C) Only III
(D) I and III

5. Statements: All chairs are tables. Some tables are wooden.
Conclusions:
I. Some chairs are wooden.
II. All tables are wooden.
III. All tables are chairs.
(A) Only I
(B) Only II
(C) Only III
(D) None of the above

6. Statements: Some pens are books. No book is a pencil.
Conclusions:
I. Some pens are not pencils.
II. All books are pens.
III. Some pens are pencils.
(A) Only I
(B) Only II
(C) Only III
(D) I and II

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Directions (Q.No. 7 to 9) : Each of the following sentences is given with a blank space to be filled with the correct phrases.

7. It is a common criticism that most people who live in their _____, are not aware of real-life challenges.

- (A) Homes
- (B) Glass palaces
- (C) Ivory towers
- (D) Big flats

8. I arranged to meet Mohan in the mall yesterday, but he didn't _____.

- (A) Fall off
- (B) Turn up
- (C) Move in
- (D) Show off

9. With the novel's _____ end, readers were left contemplating the characters' futures.

- (A) Caveat
- (B) Cliffside
- (C) Cliffhanger
- (D) Cave-in

Directions (Q.No. 10 to 12) : Arrange the jumbled sentences given in a logical and meaningful order to form a coherent paragraph or sentence.

Choose the correct sequence from the options provided.

10. Jumbled sentences:

1. Someone had been smart enough to remove it before I went on the rampage.

2. My hands had been itching to tear down that collage from my bedroom wall.

3. But I found the wall bare.

4. So, I entered my room in a hurry.

(A) 4, 1, 2, 3

(B) 1, 2, 3, 4

(C) 2, 4, 3, 1

(D) 3, 2, 1, 4

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11. Jumbled sentences:

1. Call it the third wave sweeping the Indian media...
2. Now, they are starring in a new role, as suave dealmakers who are in a hurry to strike alliances and agreements...
3. Look around and you will find a host of deals that have been inked or are ready to be finalized.
4. Then the media barons wrested back control from their editors and turned marketing warriors with the brand as their missile.
5. The first came with those magnificent men in their mahogany chambers who took on the world with their mighty fountain pens.

- (A) 1, 3, 2, 5, 4
 (B) 1, 5, 4, 2, 3
 (C) 1, 3, 2, 4, 5
 (D) 3, 5, 2, 4, 1

12. Jumbled sentences:

1. The celebrations of economic recovery in Washington may be as premature...
2. Meanwhile, in the real world, the struggles of families and communities continue...
3. Washington responded to the favourable turn in economic news with enthusiasm.
4. The celebrations and high-fives... are not to be found beyond the Beltway.
5. When the third quarter GDP showed growth..., euphoria gripped the US capital.

- (A) 5, 3, 2, 4, 1
 (B) 1, 3, 5, 4, 2
 (C) 5, 3, 1, 2, 4
 (D) 3, 5, 4, 1, 2

Directions (Q.No. 13 to 15) : For the sentences given below, identify the parts of speech for the underlined words.

13. Regardless of the weather, we'll proceed.

- (A) Adverb
 (B) Conjunction
 (C) Preposition
 (D) Noun

14. He greeted her with a courteous nod.

- (A) Adverb
 (B) Adjective
 (C) Noun
 (D) Verb

15. I heard that she relocated.

- (A) Pronoun
 (B) Adverb
 (C) Conjunction
 (D) Determiner

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Directions (Q.No. 16 to 20) : Choose the option that is the most appropriate synonym (word with the closest meaning) for the given words.

16. ELUSIVE

- (A) Clear
- (B) Truthful
- (C) Paramount
- (D) Baffling

17. COMMOTION

- (A) Intrepidity
- (B) Perusal
- (C) Confusion
- (D) Harmony

18. MALFEASANCE

- (A) Honesty
- (B) Mistake
- (C) Corruption
- (D) Neglect

19. FOSTERING

- (A) Nurturing
- (B) Promoting
- (C) Neglecting
- (D) Safeguarding

20. PROPEL

- (A) Burst
- (B) Acclimatize
- (C) Drive
- (D) Control

Directions (Q.No. 21 to 25) : Each of the following sentences is given with a blank space to be filled with the correct preposition.

21. She is interested _____ learning Spanish.

- (A) for
- (B) at
- (C) in
- (D) on

22. He hinted _____ some loss of treasure.

- (A) at
- (B) with
- (C) on
- (D) of

23. Eggs are sold _____ the dozen.

- (A) at
- (B) by
- (C) to
- (D) for

24. This is in conformity _____ the rules.

- (A) with
- (B) for
- (C) about
- (D) against

25. Our flat is _____ the second floor of the building.

- (A) by
- (B) on
- (C) into
- (D) at

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26. Select the word pair in which the two words are related in the same way as are the two words in the given word pair.

Army : General

- (A) Hospital : Patient
- (B) Worker : Factory
- (C) University : Student
- (D) Company : Director

27. In the following question, four words have been given out of which three are alike in some manner and the fourth one is different. Choose the odd one:

- (A) Ornithology
- (B) Ophthalmology
- (C) Osteology
- (D) Nephrology

28. In the following pairs of numbers choose the odd one:

- (A) 24 : 11
- (B) 30 : 13
- (C) 42 : 17
- (D) 44 : 23

29. How many such pairs of letters are there in the word 'CONDITION', each of which has as many letters in between in the word (both forward and backward direction) as they have in between in the English alphabetical series?

- (A) One
- (B) Two
- (C) Three
- (D) Four

30. All the persons in a row are facing north, A is 30th from the right and B is 25th from the right. If A and B exchange their positions, then at what position is A now, provided there are 50 persons in all?

- (A) 32
- (B) 26
- (C) 28
- (D) 30

31. Shraddha says to Sharayu, "Your mother in law is my father's mother who is the eldest son, but your husband is not my father." How is Sharayu related to Shraddha?

- (A) Niece
- (B) Daughter
- (C) Mother
- (D) Aunt

32. 'A + B' means 'A is the father of B'

'A - B' means 'A is the wife of B'

'A × B' means 'A is a brother of B'

'A ÷ B' means 'A is a daughter of B'

Then what does the expression 'P - R × Q + S' imply?

- (A) P is the sister-in-law of R
- (B) P is the sister-in-law of Q
- (C) Q is the sister-in-law of P
- (D) P is the sister-in-law of S

33. In a certain code language 'BROWSE' is written as 'GUYQTD'. How will 'AMALGAM' be written as in that language?

- (A) OCINCOC
- (B) PMDGCPD
- (C) DPMDGCP
- (D) COWCICO

34. If the first day of May 2014 was Sunday, then how many Tuesdays will be there in the months of May and June of 2014?

- (A) 14
- (B) 11
- (C) 9
- (D) 18



35. Consider the following:

A, B, C, D, E, F, G and H are standing in a row facing north. B is not neighbour of G. F is to the immediate right of G and neighbour of E. G is not at the extreme end. A is sixth to the left of E. H is sixth to the right of C.

Which of the following is correct in respect of above?

- (A) C is the immediate left of A
- (B) D is the immediate neighbour of B and F
- (C) G is the immediate right of D
- (D) A and E are not at the extreme ends

36. Which of the following terms will replace the question mark (?) in the given series?

RGHOU, MSTOOH, DHAR, FTSO, POEN, ?

- (A) DDROO
- (B) ECOSL
- (C) RIHGT
- (D) DWNO

37. Arrange the following in the logical sequence :

1. Raw data
2. Data processing
3. Analysis of data
4. Presentation of data

Choose the correct answer from the code given below :

Code :

- (A) 1, 2, 4, 3
- (B) 1, 4, 3, 2
- (C) 2, 3, 4, 1
- (D) 1, 3, 2, 4

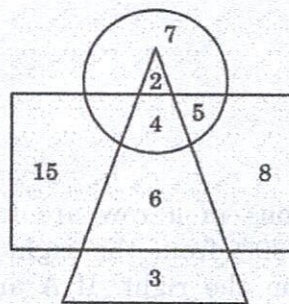
38. Seven people are sitting in a straight line viz. Gautam, Palak, Varun, Diya, Krishi, Rudra and Lalit. Who among these is sitting exactly in the middle of the line?

Statement I : Gautam is sitting at one end of the line. Varun is sitting third to the right of Gautam.

Statement II : Rudra is sitting third to the left of Palak. Lalit is sitting second from the right end of the line.

- (A) Data in Statement - II alone is sufficient to answer the question.
- (B) Data in Statement - I alone is sufficient to answer the question.
- (C) Data in Statements I and II together are not sufficient to answer the question.
- (D) Data either in Statement I alone or Statement II alone is sufficient to answer the question.

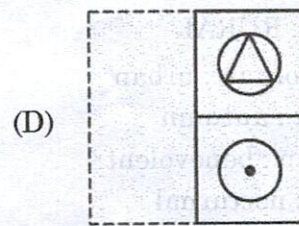
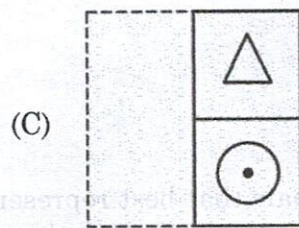
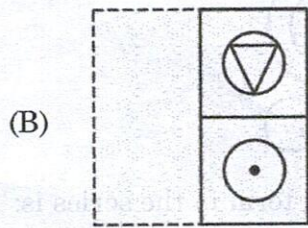
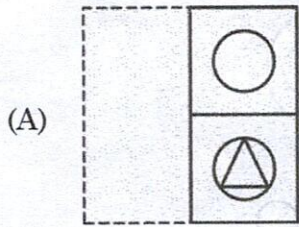
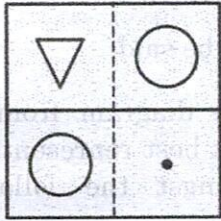
39. How many balls are neither bat nor tyre?



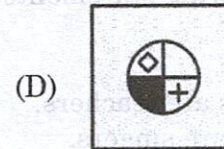
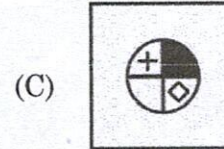
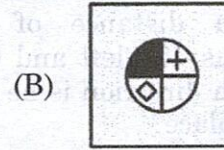
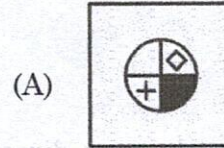
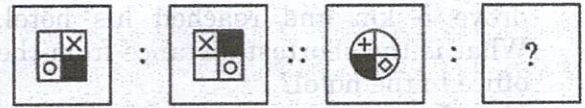
- (A) 15
- (B) 21
- (C) 23
- (D) 8



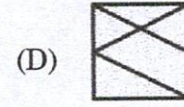
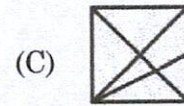
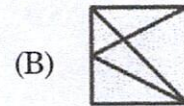
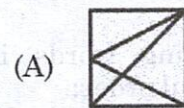
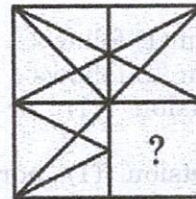
40. In the following question a square transparent paper is given in a certain pattern. What will it look like if the transparent paper is folded with a dotted line according to the given pattern?



41. Select the option that is related to the third figure in the same way as the second figure is related to the first figure.



42. Select the answer figure that will complete the pattern in the question figure.





43. Mayank started driving from his office to the hotel. He drove 10 km north. From there, he turned right and drove 8 km. Then he turned right and drove 6 km. Again, he turned right and drove 5 km and reached his hotel. What is the shortest distance from the office to the hotel?

- (A) 5 km
- (B) 9 km
- (C) 2 km
- (D) 6 km

44. Ravi is walking in the east direction. After covering a distance of one kilometer, he turns 45° left and then 90° right. In which direction is he now from his starting place?

- (A) North-West
- (B) North-East
- (C) West
- (D) South-East

45. Consider the following statements and conclusions:

Statements:

1. All engineers are teachers.
2. All teachers are singers.

Conclusions:

1. All engineers are singers.
2. No engineer is singer.

Which of the following option is correct?

- (A) Only conclusion (1) follows
- (B) Only conclusion (2) follows
- (C) Either conclusion (1) or (2) follows
- (D) Neither conclusion (1) nor (2) follows

46. Arrange the following words in a logical and meaningful order:

1. Accident
2. Ambulance
3. Rash driving
4. Injury
5. Hospital
6. Treatment

- (A) 3, 1, 2, 4, 5, 6
- (B) 3, 4, 1, 2, 5, 6
- (C) 3, 1, 4, 2, 5, 6
- (D) 3, 1, 4, 2, 6, 5

- 47. (i) All the trees in the park are flowering trees.
- (ii) Some of the trees in the park are dogwoods.
- (iii) All dogwoods are flowering trees.

If the first two statements are true then the third one is:

- (A) True
- (B) False
- (C) Uncertain
- (D) Nothing can be said

48. Choose the Venn diagram from the given options that best represents the relationship amongst the following classes:

Mothers, Doctors, Homosapiens

- (A)
- (B)
- (C)
- (D)

49. The missing term in the series is:

664, 332, 340, 170, _____, 89

- (A) 85
- (B) 97
- (C) 109
- (D) 178

50. Choose the pair that best represents a similar relationship to the one expressed in the original pair of words:

PASTORAL : RURAL

- (A) metropolitan : urban
- (B) harvest : autumn
- (C) agrarian : benevolent
- (D) sleepy : nocturnal



51. If the rank of the matrix $\begin{pmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{pmatrix}$

is 2 then the three points (x_1, y_1) , (x_2, y_2) , (x_3, y_3) in the xy -plane lie on:

- (A) an ellipse
- (B) a straight line
- (C) a parabola
- (D) a circle

52. If A is a non-zero 1×4 column-matrix and B is a non-zero 3×1 row-matrix, then AB is a 4×3 matrix and rank of AB is:

- (A) 1
- (B) 2
- (C) 3
- (D) 4

53. Consider the system of linear equations $2x + y + z = -6a$, where

$$2x + y + (b+1)z = 4,$$

$$bx + 3y + 2z = 2a$$

a and b are real numbers. If the system is consistent and has a unique solution then:

- (A) $b = 0$ or 6 , a can have any value
- (B) $b \neq 0$ or $b \neq 6$, a can have any value
- (C) $a = 0$, $b = 6$
- (D) $a = 6$, $b = 0$

54. The number of linearly independent solutions of the system of linear

$$2x + 3y - z = 0,$$

$$x - y - z + w = 0,$$

equations $3x + y - 2z + 3w = 0$, is:

$$3x + 2y - 3z + 3w = 0$$

- (A) 1
- (B) 2
- (C) 0
- (D) 3

55. If A and B are two non-zero square matrices of same order over real numbers such that $AB = 0$ then:

- (A) $|A| \neq 0$ and $|B| \neq 0$
- (B) $|A| = 0$ but $|B| \neq 0$
- (C) $|A| \neq 0$ but $|B| = 0$
- (D) $|A| = 0$ and $|B| = 0$

56. The dimension of the Eigen space of

$$\text{the matrix } A = \begin{pmatrix} 1 & -1 & 2 \\ 2 & -2 & 4 \\ 3 & -3 & 6 \end{pmatrix}$$

corresponding to the non-zero Eigen value of it is:

- (A) 34
- (B) 2
- (C) 0
- (D) 1

57. If the Eigen values of 4×4 matrix A are $1, -1, i, -i$, then multiplicative inverse of A is:

- (A) A
- (B) A^2
- (C) A^3
- (D) A^4

58. If the Eigen values of a 3×3 matrix A are $-2, -2, 1$ then the Eigen values of $A^4 + A^3 - A$ are:

- (A) 10, 10, 1
- (B) -10, -10, -1
- (C) -8, -8, 1
- (D) 8, 8, -1



59. The value of $\lim_{x \rightarrow 1-0} \frac{\sqrt{1-\cos(x-1)}}{x-1}$ is :

- (A) $\frac{1}{\sqrt{2}}$
 (B) $-\frac{1}{\sqrt{2}}$
 (C) does not exist
 (D) 0

60. If $f(x) =$

$$\begin{cases} x, & \text{if } x \text{ is a rational number} \\ 1-x, & \text{if } x \text{ is an irrational number} \end{cases}$$

where $x \in \mathbf{R}$, then

- (A) f is continuous at every rational point except $x = \frac{1}{2}$
 (B) f is continuous at every rational point
 (C) f is continuous at all points in \mathbf{R}
 (D) f is discontinuous at every point except $x = \frac{1}{2}$

61. If $x\sqrt{1-y^2} + y\sqrt{1-x^2} = a$, ($0 < a < 1$)

then the value of $\frac{d^2y}{dx^2}$ when $y = 0$ is:

- (A) $-\frac{a}{(1-a^2)^{\frac{3}{2}}}$
 (B) $\frac{a}{(1-a^2)^{\frac{2}{3}}}$
 (C) $-\frac{1}{(1-a^2)^{\frac{3}{2}}}$
 (D) $\frac{1}{(1-a^2)^{\frac{3}{2}}}$

62. In the Cauchy's Mean value theorem $\frac{f(b)-f(a)}{g(b)-g(a)} = \frac{f'(c)}{g'(c)}$ if $f(x) = \frac{1}{x}$ and

$g(x) = \frac{1}{x^2}$ then c is:

- (A) G.M. between a and b
 (B) H.M. between a and b
 (C) A.M. between a and b
 (D) $\frac{b-a}{2}$

63. The Value of $\lim_{x \rightarrow \infty} x \left(a^{\frac{1}{x}} - 1 \right)$, where

$a > 0$, is:

- (A) e^a
 (B) a^e
 (C) $\log_e a$
 (D) $\log_a e$

64. For maximum volume of a right circular cone with a constant slant height, the vertical height of the cone is

- (A) equal to diameter of its base
 (B) equal to radius of its base
 (C) equal to $\sqrt{2}$ times radius of its base
 (D) equal to $\frac{1}{\sqrt{2}}$ times radius of its base

65. At the point $(0, 0)$ the function $f(x, y) = 2x^4 - 3x^2y + y^2$ has

- (A) a minimum value
 (B) a maximum value
 (C) no stationary value
 (D) neither maximum value nor minimum value

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66. If $u = \sin^{-1} \left(\frac{x^{\frac{1}{3}} + y^{\frac{1}{3}}}{x^{\frac{1}{2}} + y^{\frac{1}{2}}} \right)^{\frac{1}{2}}$ then

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$$

(A) $\frac{1}{12} \cot u$

(B) $-\frac{1}{12} \tan u$

(C) $-\frac{1}{6} \cot u$

(D) $\frac{1}{6} \tan u$

67. In the Taylor's expansion of $e^{-x} + \cos x$ about the point $x = \frac{\pi}{2}$, the coefficient

of $\left(x - \frac{\pi}{2}\right)^4$ is:

(A) $\frac{1}{24} e^{-\frac{\pi}{2}}$

(B) $-\frac{1}{24} e^{\frac{\pi}{2}}$

(C) $-\frac{1}{24} \left(1 - e^{\frac{\pi}{2}}\right)$

(D) $\frac{1}{24} \left(1 - e^{-\frac{\pi}{2}}\right)$

68. In the Taylor's expansion of $f(x, y) = e^x \sin y$ about the point $\left(-1, \frac{\pi}{4}\right)$, the coefficient of $(x+1)\left(y - \frac{\pi}{4}\right)$ is:

(A) $\frac{1}{2e}$

(B) $-\frac{1}{2e}$

(C) $\frac{1}{e\sqrt{2}}$

(D) $-\frac{1}{e\sqrt{2}}$

69. In the Fourier's expansion $f(x) = \frac{a_0}{2} + \sum a_n \cos nx$ for $|\cos x|$ in the interval $(-\pi, \pi)$, the value of a_0 is:

(A) $\frac{1}{\pi}$

(B) $\frac{4}{\pi}$

(C) $-\frac{1}{\pi}$

(D) $-\frac{4}{\pi}$

70. The maximum rate of change of the function $\phi = x^2 yz$ at the point $(1, 0, -1)$ occurs in the direction of:

(A) $-\hat{j}$

(B) \hat{j}

(C) $-\hat{k}$

(D) $\hat{i} - \hat{j} + \hat{k}$

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71. If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ and \vec{a} is a constant vector then $\text{curl}(\vec{r} \times \vec{a}) =$:

- (A) $2\vec{a}$
- (B) $-2\vec{a}$
- (C) $3\vec{a}$
- (D) $-3\vec{a}$

72. If $\phi(x, y, z)$ is a differentiable scalar point function then, $\text{curl}(\phi \text{ grad } \phi) =$

- (A) $\text{grad } \phi$
- (B) $-\text{grad } \phi$
- (C) $\vec{0}$
- (D) $\text{div}(\text{grad } \phi)$

73. The work done by the force $\vec{F} = (4x^2 - y^2 + x)\hat{i} - (2xy + y)\hat{j}$ in moving a particle from the point (0, 0) to the point (1, 1) along the parabola $y^2 = x$ is :

- (A) $\frac{1}{4}$
- (B) $\frac{1}{5}$
- (C) $\frac{1}{2}$
- (D) $\frac{1}{3}$

74. The volume common to the cylinders $x^2 + y^2 = 1$ and $x^2 + z^2 = 1$ is :

- (A) $\frac{4\pi}{3}$ cubic unit
- (B) $\frac{16}{3}$ cubic unit
- (C) $\frac{8\pi}{3}$ cubic unit
- (D) $\frac{1}{3}$ cubic unit

75. The value of the surface integral $\int_S [xi + yj + (z^2 - 1)k] \cdot \hat{n} ds$ where S is the surface of the closed cylinder $x^2 + y^2 = 4$, bounded by $z = 0$ and $z = 1$, is:

- (A) 12π
- (B) 2π
- (C) 3π
- (D) 4π

76. The order and degree of the differential equation of the family of circles in the xy - plane with a given radius k are :

- (A) 2 and 2
- (B) 2 and 1
- (C) 2 and 3
- (D) 1 and 2

77. The singular solution of the differential equation

$$y = x \frac{dy}{dx} + \sqrt{a^2 \left(\frac{dy}{dx} \right)^2 + b^2} \text{ is :}$$

- (A) an ellipse
- (B) a parabola
- (C) straight line
- (D) a circle

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78. The general solution of the differential

equation $(x + 2y^3) \frac{dy}{dx} = y$ is:

- (A) $x = y^2 + Cy$
- (B) $y = y^2 + Cy$
- (C) $y = x^3 + Cx$
- (D) $x = y^3 + Cy$

79. The particular integral of the

differential equation $\frac{d^2y}{dx^2} + 4y = \sin 2x$

is:

- (A) $y = -\frac{x}{4} \cos 3x$
- (B) $y = \frac{x}{4} \cos 3x$
- (C) $y = -\frac{x}{4} \cos 2x$
- (D) $y = \frac{x}{4} \cos 2x$

80. The solution of the IVP

$\frac{d^2y}{dx^2} + \mu x = 0$; $y = a$ and $\frac{dy}{dx} = 0$ when

$x = \frac{\pi}{\sqrt{\mu}}$ is :

- (A) $y = a \cos \sqrt{\mu} x$
- (B) $y = -a \cos \sqrt{\mu} x$
- (C) $y = a \sin \sqrt{\mu} x$
- (D) $y = -a \sin \sqrt{\mu} x$

81. An integer is chosen at random from first 200 positive integers. The probability that the integer is divisible by 6 or 8 is:

- (A) $\frac{1}{6}$
- (B) $\frac{1}{8}$
- (C) $\frac{3}{4}$
- (D) $\frac{1}{4}$

82. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both spades. The probability of the lost card being a spade is:

- (A) $\frac{49}{50}$
- (B) $\frac{11}{50}$
- (C) $\frac{13}{50}$
- (D) $\frac{1}{50}$

83. The minimum number of times must a man toss a fair coin so that the probability of getting at least one head is more than 90%, is :

- (A) 4
- (B) 10
- (C) 90
- (D) 5

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84. If X has Poisson distribution such that $P(X=2) = 9P(X=4) + 90P(X=6)$ then the Mean of the distribution is:

- (A) 2
- (B) 4
- (C) 6
- (D) 1

85. The Mean and Standard deviation of seven observation are 8 and 4 respectively, if five observations are 2, 4, 10, 12, 14 then the remaining two observations are :

- (A) 4 and 8
- (B) 6 and 8
- (C) 4 and 6
- (D) 5 and 7

86. If $f(x)$ be the continuous probability density function of a random variable X , then $P(a \leq X < b)$ is:

- (A) $f(b) - f(a)$
- (B) $f(b - a)$
- (C) $\int_a^b xf(x)dx$
- (D) $\int_a^b f(x)dx$

87. If two independent Random Variables X and Y be uniformly distributed over the interval $[-1, 1]$ then the probability that maximum of X and Y is less than 0.5 is:

- (A) 0.5625
- (B) 0.5265
- (C) 0.5256
- (D) 0.5526

88. If X is a normal variable with mean 30 and standard deviation 5 and with usual notation given that $A(Z = 0.4) = 0.1554$, then

$P(28 \leq X \leq 32)$ is:

- (A) 0.2881
- (B) 0.5762
- (C) 0.4662
- (D) 0.3108

89. The primary purpose of hypothesis testing in Statistics is:

- (A) To estimate the population mean
- (B) To determine the correlation between two variables
- (C) To test the Null hypothesis for possible rejection
- (D) To test the Alternative hypothesis for possible rejection



90. Correct statement about Student's t-Test in Statistics is :

- (A) The t-test is used to compare the means of two independent populations with different variances.
- (B) The t-test is used to compare the means of two dependent populations, such as before and after observations.
- (C) The t-test assumes that the data follows a normal distribution.
- (D) All the above three statements are true.

91. In Simpson's $\frac{3}{8}$ th rule the number of sub-intervals of the interval of integration must be:

- (A) even
- (B) odd
- (C) multiple of 3
- (D) multiple of 5

92. In Simpson's $\frac{1}{3}$ rd rule the interpolating polynomial is of degree:

- (A) 1
- (B) 2
- (C) 3
- (D) 4

93. The error in computing the integral $\int_0^1 \frac{1}{1+x} dx$ using Trapezoidal rule correct to four decimal places using three equidistant ordinates (given $\log 2 = 0.6931$) is:

- (A) 0.0003
- (B) 0.0013
- (C) 0.0023
- (D) 0.0033

94. The Newton-Raphson formula for calculating the square root of a number positive number N is given by:

(A) $x_{n+1} = \frac{1}{2} \left(2x_n + \frac{N}{x_n} \right)$

(B) $x_{n+1} = \frac{1}{2} \left(2x_n - \frac{N}{x_n} \right)$

(C) $x_{n+1} = \frac{1}{2} \left(x_n + \frac{N}{x_n} \right)$

(D) $x_{n+1} = \frac{1}{2} \left(x_n - \frac{N}{x_n} \right)$

95. If $f(x)$ is continuous in the interval $[a, b]$ and the equation $f(x)=0$ does not have a root in the interval $[a, b]$ then:

- (A) $f(a).f(b)=0$
- (B) $f(a).f(b)\leq 0$
- (C) $f(a).f(b)< 0$
- (D) $f(a).f(b)> 0$

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96. The equation $x^3 - 4x - 1 = 0$ to be solved numerically by Newton-Raphson method with initial approximate root as 2. The first improved value of the root is:

- (A) 2.215
- (B) 2.515
- (C) 2.125
- (D) 2.152

97. The equation $x^3 - 4x - 1 = 0$ to be solved numerically by fixed point iteration method with initial approximate root as 2. The iterative formula is:

- (A) $x_{n+1} = \frac{1}{4}(x_n^3 - 1)$
- (B) $x_{n+1} = (4x_n + 1)^{\frac{1}{3}}$
- (C) $x_{n+1} = \frac{1}{4}(x_n^3 + 1)$
- (D) $x_{n+1} = (4x_n^3 - 1)^{\frac{1}{3}}$

98. In solving the system of linear equations $x + y + 5z = -1$
 $5x - y + z = 10$
 $x + 2y = 6$

by Gauss-Seidal method taking initial approximations to the roots as 0 each, the first iteration to the roots are:

- (A) $x = 2, y = 3, z = -0.2$
- (B) $x = 2.6, y = 1.7, z = -1.06$
- (C) $x = 2, y = 2, z = -1$
- (D) $x = 2.64, y = 2, z = -1.2$

99. Given $\frac{dy}{dx} = xy, y(1) = 1$, the value of y for $y = 1.1$ with single stepsize 0.1, by Taylor's series method, correct to four decimal places is:

- (A) 1.0012
- (B) 1.0013
- (C) 1.0006
- (D) 1.0007

100. In solving an ODE of 1st order by Runge-Kutta method of 4th order, after calculating k_1, k_2, k_3, k_4 with usual notation, the value of $y(x_0 + h)$ is given by $y_0 + k$, where $k =$

- (A) $\frac{1}{4}(k_1 + 2k_2 + 2k_3 + k_4)$
- (B) $\frac{1}{4}(k_1 + k_2 + k_3 + k_4)$
- (C) $\frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$
- (D) $\frac{1}{4}(k_1 + 2k_2 + 2k_3 + 2k_4)$

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