7

QUESTION PAPER SERIES CODE
A

Centre Name : _____

Roll No. : _____

Name of Candidate : _____

S A U

Entrance Test for M.Sc. (Applied Mathematics), 2014

[PROGRAMME CODE : MAM]

Time : 3 hours *Maximum Marks* : 100

INSTRUCTIONS FOR CANDIDATES

Candidates must carefully read the following instructions before attempting the Question Paper :

(i) Write your Name, Roll Number and Centre Name in the space provided for the purpose on the top of this Question Paper and in the OMR/Answer Sheet.

(ii) This Question Paper has Three Parts : Part—A, Part—B and Part—C.

(iii) Part—A (Objective-type) has 20 questions of **1** mark each. All questions are compulsory.

(iv) Part—B (Objective-type) has 30 questions of **1** mark each. All questions are compulsory.

(v) Part—C (Objective-type) has 50 questions of **1** mark each. All questions are compulsory.

(vi) Symbols have their usual meanings.

(vii) **Please darken the appropriate Circle of 'Question Paper Series Code' and 'Programme Code' on the OMR/Answer Sheet in the space provided.**

(viii) Part—A, Part—B and Part—C (Multiple Choice) questions should be answered on OMR/Answer Sheet.

(ix) Answers written by the candidates inside the Question Paper will **NOT** be evaluated.

(x) Calculators and Log Tables may be used. Mobile Phones are **NOT** allowed.

(xi) Pages at the end have been provided for Rough Work.

(xii) **Return the Question Paper and the OMR/Answer Sheet** to the Invigilator at the end of the Entrance Test.

(xiii) **DO NOT FOLD THE OMR/ANSWER SHEET.**

INSTRUCTIONS FOR MARKING ANSWERS IN THE 'OMR SHEET'

Use BLUE/BLACK Ballpoint Pen Only

1. **Please ensure that you have darkened the appropriate Circle of 'Question Paper Series Code' and 'Programme Code' on the OMR Sheet in the space provided.**

***Example* :**

Question Paper Series Code

Write Question Paper Series Code A or B and darken appropriate circle.

	A or B

● Ⓑ

Programme Code

Write Programme Code out of 14 codes given and darken appropriate circle.

Write Programme Code

MEC	○	MAM	●	PCS	○
MSO	○	MLS	○	PBT	○
MIR	○	PEC	○	PAM	○
MCS	○	PSO	○	PLS	○
MBT	○	PIR	○		

2. Use only Blue/Black Ballpoint Pen to darken the Circle. Do not use Pencil to darken the Circle for Final Answer.
3. Please darken the whole Circle. ●
4. Darken ONLY ONE CIRCLE for each question as shown below in the example :

***Example* :**

Wrong	Wrong	Wrong	Wrong	Correct
● ⓑ ⓒ ●	Ⓐ ⓑ ⓒ ⓓ	Ⓐ ⓑ ⓒ Ⓓ	◉ ⓑ ⓒ ●	ⓐ ⓑ ⓒ ●

5. Once marked, no change in the answer is allowed.
6. Please do not make any stray marks on the OMR Sheet.
7. Please do not do any rough work on the OMR Sheet.
8. Mark your answer only in the appropriate circle against the number corresponding to the question.
9. There will be no negative marking in evaluation.
10. Write your six digits Roll Number in small boxes provided for the purpose; and also darken appropriate circle corresponding to respective digits of your Roll Number as shown in the example below.

***Example* :**

ROLL NUMBER

1	3	5	7	2	0
●	①	①	①	①	①
②	②	②	②	●	②
③	●	③	③	③	③
④	④	④	④	④	④
⑤	⑤	●	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	●	⑦	⑦
⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨
⓪	⓪	⓪	⓪	⓪	●

PART—A

In Q. Nos. **1–4**, choose the correct option to locate the error in the corresponding sentence :

1. We have no choice but to appoint Mary : she is the best of the two candidates, and there is no prospect of finding more applicants.

(a) but

(b) Mary

(c) best

(d) is

2. The reason I will not be going to Mexico this year is because I will use up all my travel money attending an important meeting in Singapore.

(a) will

(b) going

(c) because

(d) attending

3. If you were to work at least four hours a day on the project, we would complete it in a shorter time, and with less problems.

(a) were

(b) would

(c) shorter

(d) No error

4. The manager tried hard to effect a change in company policy, but the owner, who steadfastly refused to compromise, overruled him on every point.

(a) effect

(b) but

(c) compromise

(d) No error

In Q. Nos. **5–8**, choose the pair which has the similar relationship as in the given pair :

5. PAIN : SEDATIVE

(a) comfort : stimulant

(b) grief : consolation

(c) trance : narcotic

(d) ache : extraction

6. LIGHT : BLIND

(a) speech : dumb

(b) language : deaf

(c) tongue : sound

(d) voice : vibration

7. AFTER : BEFORE

(a) first : second

(b) present : past

(c) contemporary : historic

(d) successor : predecessor

8. DISTANCE : MILE

(a) liquid : litre

(b) bushel : corn

(c) weight : scale

(d) fame : television

In Q. Nos. **9–11**, choose the word which is the exact OPPOSITE of the given words :

9. COMMISSIONED

(a) Started

(b) Closed

(c) Finished

(d) Terminated

10. PERTINENT

(a) Irrational

(b) Irregular

(c) Insistent

(d) Irrelevant

11. OBSCURE

(a) Implicit

(b) Obnoxious

(c) Explicit

(d) Pedantic

12. At a party, you meet your mother's only sister's husband's only sister-in-law. This person is your

(a) aunt

(b) mother

(c) daughter

(d) sister

13. Consider the following statements :

(i) If a company hires 3 employees and no one leaves, then there are at least 20 employees in the company.

(ii) If 3 employees leave the company and no one is hired, then there will be less than 15 employees in the company.

To know the number of employees in the company

(a) Statement (i) alone is sufficient

(b) Statement (ii) alone is sufficient

(c) both statements are sufficient, but neither statement alone is sufficient

(d) each statement alone is sufficient

14. Consider the following statements :

(i) Joe bought 2 paperback books and 3 hardcover books for 20 dollars.

(ii) Paul bought 4 paperback books and 6 hardcover books for 35 dollars.

To know the price of 1 paperback book and 1 hardcover book

(a) Statement (i) alone is sufficient

(b) Statement (ii) alone is sufficient

(c) both statements are sufficient, but neither statement alone is sufficient

(d) each statement alone is sufficient

15. If 3 and 8 are the lengths of two sides of a triangle, the length of third side can be

(a) 8 only

(b) 11 only

(c) 5 or 8 only

(d) 8 or 11 only

16. A rabbit on a control diet is fed daily 300 grams of a mixture of two foods X and Y. Food X contains 10 percent and food Y contains 15 percent of protein. If rabbit's diet provides exactly 38 grams of protein daily, how many grams of food X are in the mixture?

(a) 100

(b) 140

(c) 150

(d) 160

17. Of the 3600 employees of a company, one-third is clerical. If the clerical staff were to reduce by one-third, what percent of the total number of the remaining employees would then be clerical?

(a) 25

(b) 22·2

(c) 20

(d) 12·5

18. 10 percent of 50 percent of 250 is

(a) 10

(b) 12·5

(c) 25

(d) 1·25

19. *A* comes before *B* but not after *C*. *D* comes after *B* and before *C*. The correct sequence is

(a) *ABCD*

(b) *ACBD*

(c) *ABDC*

(d) *ADBC*

20. The next number in the sequence 1, 3, 7, 15, 31, ··· is

(a) 61

(b) 63

(c) 65

(d) 67

PART—B

21. Identify one of the following functions which has a limit as x tends to zero.

(a) $\sin[x]$

(b) $\sin\left(\frac{\pi}{2}[x]\right)$

(c) $\sin(\pi[x])$

(d) $\cos[x]$

22. $\lim\limits_{\{x\to 0\}} \frac{3^x - 3^{-x}}{x}$ is

(a) 2 log 3

(b) ln 3

(c) $\frac{1}{2}\ln 3$

(d) 0

23. Which of the following functions is differentiable at $x = 0$?

(a) $\cos(|x|)+|x|$

(b) $\cos(|x|)-|x|$

(c) $\sin(|x|)+|x|$

(d) $\sin(|x|)-|x|$

24. The projection of $A = \hat{i} - 2\hat{j} + 3\hat{k}$ on the vector $B = \hat{i} + 2\hat{j} + 2\hat{k}$ is

(a) 0

(b) 1

(c) 2

(d) −1

25. If the lines $3x-4y+7=0$ and $ax+6y+1=0$ are perpendicular, then a is equal to

(a) 0

(b) 4

(c) 8

(d) -8

26. The distance between the lines $3x+4y=6$ and $6x+8y=15$ is

(a) 3

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

(c) $\frac{3}{4}$

(d) $\frac{3}{10}$

27. The vertex of the parabola $y^2+4x+4y-3=0$ is

(a) $\left(\frac{7}{4}, -2\right)$

(b) $\left(-\frac{7}{4}, 2\right)$

(c) $\left(-2, \frac{7}{4}\right)$

(d) $\left(2, -\frac{7}{4}\right)$

28. If the line $3x+5y=k$ touches the ellipse $16x^2+25y^2=400$, then k is

(a) ± 5

(b) ± 25

(c) $\pm\sqrt{5}$

(d) ± 10

29. The eccentricity of the curve $x^2 - 3y^2 - 2x = 8$ is

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

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

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

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

30. If $f(x) = x + \int_x^1 f(s)\,ds$, then the value of $\int_0^1 f(x)\,dx$ is

(a) 0

(b) e

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

(d) 1

31. The value of $\sin(-240°)$ is

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

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

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

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

32. If the tangent of an angle is negative and its secant is positive, then the quadrant in which the angle terminates is

(a) *I*

(b) *II*

(c) *III*

(d) *IV*

33. If $\sin(x+20°) = \cos x$, the value of x is

(a) 35°

(b) 45°

(c) 55°

(d) 70°

34. The average daily wage of 50 workers of a factory was ₹ 50. If 20 workers are given a rise of ₹ 20 each, then the average daily wage (x) is

(a) $x = ₹ 70$

(b) $x = ₹ 64$

(c) $x = ₹ 58$

(d) $x = ₹ 50$

35. Two events A and B are independent, if

(a) A and B are mutually exclusive

(b) $P(A) = P(B)$

(c) $P(A' \cap B') = (1 - P(A))(1 - P(B))$

(d) $P(A) + P(B) = 1$

36. Let us take an arithmetic progression $a, a+d, a+2d, \cdots, a+2kd$. Then mean deviation from the mean and standard deviation of the arithmetic progression among themselves possess which type of the following relations?

(a) Mean deviation from the mean is always greater than standard deviation

(b) Mean deviation from the mean is less than standard deviation

(c) Mean deviation from the mean is greater than equal to standard deviation

(d) Mean deviation from the mean is less than equal to standard deviation

37. If each element of a second-order determinant is either 0 or 1, what is the probability that the value of the determinant is non-negative?

(a) $\frac{13}{16}$

(b) $\frac{3}{16}$

(c) $\frac{7}{16}$

(d) $\frac{9}{16}$

38. The probability of a shooter hitting a target is $\frac{1}{2}$. How many minimum numbers of times must he fire so that the probability of hitting the target at least once is more than 99 percent?

(a) 4

(b) 5

(c) 6

(d) 7

39. If A and B are events such that $P(A/B) = P(B/A)$, then

(a) A is a proper subset of B

(b) $A = B$

(c) $A \cap B = \phi$

(d) $P(A) = P(B)$

40. If $P(A) = \frac{1}{2}$, $P(B) = 0$, then $P(A/B)$ is

(a) 0

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

(c) not defined

(d) 1

41. 10 is the mean of a set of 7 observations and 5 is the mean of a set of 3 observations. The mean of a combined set is given by

(a) 8·5

(b) 10

(c) 15

(d) 7·5

42. For two $n \times n$ matrices A and B with A invertible, if $B = -A^{-1}BA$, then $(A - B)^2$ is equal to

(a) 0

(b) $A^2 + 2BA + B^2$

(c) $A^2 - B^2$

(d) $A^2 + B^2$

43. Every skew-symmetric matrix of odd order is

(a) singular

(b) non-singular

(c) identity

(d) None of the above

44. If k is a scalar and A is a square matrix of order n and I is the identity matrix, then $kA(adj\, kA) =$

(a) $k^n|A|I$

(b) $k^{n-2}|A|I$

(c) $k^{n-1}|A|I$

(d) None of the above

45. Which of the following satisfies the differential equation $\frac{dy}{dx} = x^2e^{-y} + e^{x-y}$?

(a) $3e^y = x^3 + 3e^x + c$

(b) $3e^y = x^3 + 3e^{4x} + c$

(c) $3e^y = x^3 + 3e^{-x} + c$

(d) $3e^y = x^{-3} + 3e^x + c$

46. The solution of the differential equation $(x^2 - 5y)\,dx + (y^2 - 5x)\,dy = 0$ is

(a) $x^2 + y^2 = c$

(b) $x^3 - y^3 = c$

(c) $x^3 + 15xy + y^3 = c$

(d) $x^3 - 15xy + y^3 = c$

47. Let $y(x)$ be a solution of $\frac{dy}{dx} + \frac{y}{x} = \frac{2}{x}$ with $y(1) = 0$. Then $\lim_{x\to\infty} y(x)$ is equal to

(a) 0

(b) $-\infty$

(c) 2

(d) 1

48. The integrating factor of the linear differential equation $(1-x^2)\frac{dy}{dx}+2xy-x\sqrt{1-x^2}=0$ is given by

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

(b) $\frac{1}{1+y^2}$

(c) $\frac{1}{1-x^2}$

(d) $\frac{1}{1+xy}$

49. If $y(x)$ is a solution of the differential equation $\frac{dy}{dx}+2y=\beta$ with $y(0)=\alpha$, where α, β are two non-zero constants, then $\lim_{x\to\infty} y(x)$ is equal to

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

(b) $\frac{\beta}{2\alpha}$

(c) 0

(d) $\frac{\beta}{\alpha}$

50. If $y^2+2y=2e^{-x}$, then y satisfies the differential equation

(a) $(1+y)\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2=e^{-x}$

(b) $\frac{d^2y}{dx^2}+(1+y)\left(\frac{dy}{dx}\right)^2=e^{-x}$

(c) $\frac{d^2y}{dx^2}+(1+y)\left(\frac{dy}{dx}\right)^2=-e^{-x}$

(d) $(1+y)\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2=-e^{-x}$

PART—C

51. Let $f(x) = e^{-x^2}$ and $g(x) = \frac{1}{1+x^2}$. Which of the following is true?

(a) $f(x) \geq g(x)$ for all $x \geq 0$

(b) $f(x) \leq g(x)$ for all $x \geq 0$

(c) $f(x) - g(x)$ changes sign finitely many times as x varies over $[0, \infty)$

(d) $f(x) - g(x)$ changes sign infinitely many times as x varies over $[0, \infty)$

52. Let f be a polynomial defined on the interval $[0, 5]$ and it is given that $f(0) = 1$, $f(2) = -2$, $f(4) = 3$. Then in the interval $[0, 5]$, f has

(a) at least two zeros

(b) exactly two zeros

(c) more than two zeros

(d) less than two zeros

53. The point $(0, 5)$ is closest to the curve $x^2 = 2y$ at

(a) $(2\sqrt{2}, 0)$

(b) $(0, 0)$

(c) $(2, 2)$

(d) $(2\sqrt{2}, 4)$

54. Let f be an increasing function and g be a decreasing function on an interval such that $f \circ g$ exists. Then $f \circ g$ is

(a) increasing

(b) decreasing

(c) monotone

(d) neither increasing nor decreasing

55. If the function $f(x) = \frac{x^2}{x^2+1}$, $x \in R$ is one-one, then its range is

(a) $(-\infty, \infty)$

(b) $[0, 1]$

(c) $(0, \infty)$

(d) $[0, 1)$

56. Let f be a function defined on $[0, 1] \times [0, 1]$ by

$$f(x, y) = \begin{cases} 1/2, & y \text{ rational} \\ x, & y \text{ irrational} \end{cases}$$

Which of the following is true?

(a) $\int_0^1 dy \int_0^1 f\, dx = \int_0^1 dx \int_0^1 f\, dy = 1/2$

(b) $\int_0^1 dy \int_0^1 f\, dx = \int_0^1 dx \int_0^1 f\, dy = 0$

(c) $\int_0^1 dy \int_0^1 f\, dx = \int_0^1 dx \int_0^1 f\, dy = 1$

(d) $\int_0^1 dy \int_0^1 f\, dx \neq \int_0^1 dx \int_0^1 f\, dy$

57. Consider the function $f : R \to R$ defined by $f(x) = x^2$ and the function $g : (0, 1] \to R$ defined by $g(x) = \frac{1}{x}$. Then

(a) both f and g are uniformly continuous

(b) f is uniformly continuous but g is not

(c) g is uniformly continuous but f is not

(d) neither f nor g is uniformly continuous

58. By using the polar coordinates $x = r\cos\theta$, $y = r\sin\theta$, the integral $\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} e^{-(x^2+y^2)} dx\, dy$ becomes

(a) $\int_0^{2\pi} \int_0^{\infty} r e^{-r^2} dr\, d\theta$

(b) $\int_0^{2\pi} \int_0^{\infty} e^{-r^2} dr\, d\theta$

(c) $\int_0^{2\pi} \int_0^{\infty} r^2 e^{-r^2} dr\, d\theta$

(d) $\int_0^{2\pi} \int_0^{\infty} r\sin\theta \cos\theta\, e^{-r^2} dr\, d\theta$

59. In which interval, the infinite series $1+\frac{x}{2^2}+\frac{x^2}{3^2}+\frac{x^3}{4^2}+\cdots$ divergent?

(a) $(-\infty, 1)$

(b) $(1, \infty)$

(c) $(-1, 1)$

(d) $(0, \infty)$

60. Let S_3 be the group of all permutations on three symbols with the identity element e. Then the number of elements in S_3 that satisfies the equation $x^2 = e$ is

(a) 1

(b) 2

(c) 3

(d) 4

61. Let G be a group of order 15. Then the number of Sylow subgroups of G of order 3 is

(a) 0

(b) 1

(c) 3

(d) 5

62. Let p and q be distinct prime numbers. The number of generators of the cyclic group $\mathbb{Z}_{pq}$ is

(a) $(p-1)(q-1)$

(b) $2(p-1)(q-1)$

(c) pq

(d) None of the above

63. Which of the following is false?

(a) Every cyclic group is Abelian

(b) There is at least one Abelian group of every finite order > 0

(c) Every group of order ≤ 4 is cyclic

(d) Every Abelian group is cyclic

64. Every group is isomorphic to a group of permutations. This statement represents

(a) Lagrange's theorem

(b) Cayley's theorem

(c) Fermat's theorem

(d) fundamental theorem of group

65. A cycle of length 2 is known as

(a) transposition

(b) orbit

(c) circle

(d) None of the above

66. The number of distinct left cosets of the subgroup $3\mathbb{Z}$ of $\mathbb{Z}$ is

(a) 2

(b) 3

(c) 4

(d) infinite

67. Which of the following is true?

(a) Every group of prime order is cyclic

(b) Every group of odd order is cyclic

(c) Every group of even order is cyclic

(d) Every cyclic group is of prime order

68. The general solution of the first-order linear partial differential equation

$$z(x, y)\frac{\partial z(x, y)}{\partial x} + x = 0$$

is

(a) $x^2 + z^2 = f(y)$

(b) $x^2 + 5z^2 = f(y)$

(c) $x^2 - z^2 = f(y)$

(d) $y^2 = f(x) + z$

69. The general integral of

$$xz\frac{\partial z}{\partial x} + yz\frac{\partial z}{\partial y} = xy$$

is given by

(a) $f\left(\frac{x}{y},\ xy + z^2\right) = 0$

(b) $f(xy - z,\ xy - z^2) = 0$

(c) $f\left(\frac{x}{y},\ xy - z^2\right) = 0$

(d) $f(x,\ yz^2) = 0$

70. The general solution of the partial differential equation

$$\frac{\partial^2 z}{\partial x^2} = 36\frac{\partial^2 z}{\partial y^2}$$

is given by

(a) $z = f_1(y + x) + f_2(y - x)$

(b) $z = f_1(y + 36x) + f_2(y - 36x)$

(c) $z = f_1(y + 6x) + f_2(y - x)$

(d) $z = f_1(y + 6x) + f_2(y - 6x)$

71. Which of the following satisfies the linear partial differential equation

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0 \ ?$$

(a) $z = \Phi_1(y+x) + \Phi_2(y-x) + \Phi_3(y+2x) + \Phi_4(y-2x)$

(b) $z = \Phi_1(y+2x) + \Phi_2(y-2x) + \Phi_3(y+ix) + \Phi_4(y-ix)$

(c) $z = \Phi_1(y+ix) + \Phi_2(y-ix)$

(d) $z = \Phi_1(y+x) + \Phi_2(y-x) + \Phi_1(y+ix) + \Phi_2(y-ix)$

72. The linearly independent solutions of the differential equation

$$\frac{d^2y}{dx^2} + y = 0$$

are given by

(a) $y_1(x) = \sin x,\ y_2(x) = \sin x - \cos x$

(b) $y_1(x) = \sin^2 x,\ y_2(x) = \sin^2 x - \cos^2 x$

(c) $y_1(x) = \sin x,\ y_2(x) = \sin 2x - \cos 2x$

(d) $y_1(x) = \sin 3x,\ y_2(x) = \sin 3x - \cos x$

73. The solution of $\frac{d^2y}{dx^2} + y = 0$ satisfying the conditions $y(0) = 1,\ y(\pi/2) = 2$ is obtained as

(a) $\cos x + 2\sin x$

(b) $\cos x + 5\sin x$

(c) $\cos x - 2\sin x$

(d) $\cos x - 5\sin x$

74. The solution of the linear differential equation

$$\frac{d^2y}{dx^2} + (3i - 1)\frac{dy}{dx} - 3iy = 0$$

is

(a) $y(x) = c_1 e^x + c_2 \sin 3x$

(b) $y(x) = c_1 e^x + c_2 e^{-3ix}$

(c) $y(x) = c_1 e^x + c_2 \cos 3x$

(d) $y(x) = c_1 e^x + c_2 e^{ix}$

75. Two numbers A and B are approximated as C and D respectively. The relative error in $C \times D$ is given by

(a) $\left|\left(\frac{A-C}{A}\right)\right| \times \left|\left(\frac{B-D}{B}\right)\right|$

(b) $\left|\left(\frac{A-C}{A}\right)\right| + \left|\left(\frac{B-D}{B}\right)\right| + \left|\left(\frac{A-C}{A}\right)\right| \times \left|\left(\frac{B-D}{B}\right)\right|$

(c) $\left|\left(\frac{A-C}{A}\right)\right| + \left|\left(\frac{B-D}{B}\right)\right| - \left|\left(\frac{A-C}{A}\right)\right| \times \left|\left(\frac{B-D}{B}\right)\right|$

(d) $\left(\frac{A-C}{A}\right) - \left(\frac{B-D}{B}\right)$

76. If $f(x)$ is a real continuous function in $[a, b]$, and $f(a) f(b) < 0$, then for $f(x) = 0$, there is —— in the domain $[a, b]$.

(a) one root

(b) an undeterminable number of roots

(c) no root

(d) at least one root

77. If a polynomial of degree n has $n + 1$ zeros, then the polynomial is

(a) oscillatory

(b) zero everywhere

(c) quadratic

(d) not defined

78. Which of the following methods is not an iterative method?

(a) LU decomposition method

(b) Gauss-Seidel method

(c) Jacobi method

(d) Relaxation method

79. The value of $\int_{0.2}^{2.2} xe^x dx$ by using the one-segment trapezoidal rule is most nearly

(a) 11·672

(b) 11·807

(c) 20·099

(d) 24·119

80. The goal of forward elimination steps in the Naive Gauss elimination method is to reduce the coefficient matrix to a/an —— matrix.

(a) diagonal

(b) identity

(c) lower triangular

(d) upper triangular

81. Division by zero during forward elimination steps in Naive Gauss elimination of the set of equations $[A][X] = [C]$ implies the coefficient matrix $[A]$

(a) is invertible

(b) is non-singular

(c) may be singular or non-singular

(d) is singular

82. A closed half-space in R^n is a/an

(a) closed convex set

(b) open convex set

(c) closed non-convex set

(d) open non-convex set

83. The intersection of all convex sets of which a set S is a subset is known as

(a) convex hull

(b) hyperplane

(c) supporting hyperplane

(d) None of the above

84. The intersection of a finite number of closed half spaces in R^n is called a

(a) convex cone

(b) polyhedral convex set

(c) convex set

(d) closed set

85. A constraint that does not affect the feasible region is a

(a) non-negativity constraint

(b) redundant constraint

(c) standard constraint

(d) slack constraint

86. If the regression coefficients are 0·8 and $0\cdot\dot{2}$, what would be the value of coefficient of correlation?

(a) 0·4

(b) 0·2

(c) 0·1

(d) 0·3

87. If each set of observations for a variable is multiplied by a constant (non-zero) value, then the variance of the resultant variable

(a) increases

(b) decreases

(c) unaltered

(d) unknown

88. A student applies for an admission in two universities X and Y. The probability of his being selected in university X is 0·8 and being rejected at Y is 0·5. The probability of at least one of his applications being rejected is 0·6. What is the probability that he will be selected in one of the universities?

(a) 0·6

(b) 0·9

(c) 0·7

(d) 0·8

89. The probabilities of X, Y and Z becoming managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively. On becoming managers the chances of the bonus scheme to be introduced by X, Y and Z are $\frac{3}{10}$, $\frac{1}{2}$ and $\frac{4}{5}$ respectively. What is the probability that a bonus scheme is introduced?

(a) $\frac{22}{45}$

(b) $\frac{6}{45}$

(c) $\frac{19}{45}$

(d) $\frac{17}{45}$

90. Q is the mid-point of a line AB of length a units. Two points are selected at random on the line segment AQ and QB. Find the probability that the distance between them is less than $\frac{a}{2}$.

(a) 0·25

(b) 0·125

(c) 0·50

(d) 0·75

91. A continuous random variable X has a probability density function

$$f(x) = \begin{cases} x^2, & 0 \le x \le 1 \\ 0, & \text{otherwise} \end{cases}$$

Find a such that $P(X \le a) = P(X > a)$.

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

(b) $a = \frac{1}{\sqrt{2}}$

(c) $a = \left(\frac{1}{2}\right)^{\frac{1}{3}}$

(d) None of the above

92. The variables X and Y are connected by the equation $X - 2Y + 3 = 0$. Then the correlation coefficient between X and Y is

(a) 1

(b) −1

(c) −2

(d) 2

93. Starting from the origin, unit steps are taken to the right with probability p and to the left with probability $q(= 1 - p)$. Then the mean of the distance moved from origin after n steps assuming independent movements is

(a) npq

(b) $n(q - p)$

(c) $4npq$

(d) $n(p - q)$

94. When an object is at rest on a surface, then

(a) all the forces are equal

(b) there is no force on it

(c) all the forces cancel out

(d) all the forces are in the same direction

95. A force of —— acts when an object moves through air or water.

(a) No force acts

(b) friction

(c) weight

(d) deceleration

96. When an object reaches its maximum speed while falling through a fluid, we call it

(a) acceleration

(b) steady speed

(c) constant velocity

(d) terminal velocity

97. The amount of work done against friction to slide a box in a straight line across a uniform, horizontal floor depends most on the

(a) time taken to move the box

(b) distance, the box is moved

(c) speed of the box

(d) direction of the box's motion

98. When the velocity of the moving object is doubled, its —— is also doubled.

(a) acceleration

(b) kinetic energy

(c) mass

(d) momentum

99. If $\phi(x, y, z) = 3x^2y - y^2z^2$, then $\nabla\phi$ at $(1, -2, -1)$ is

(a) $-12\hat{i} - 9\hat{j} - 16\hat{k}$

(b) $3\hat{i} - 4\hat{j} + 7\hat{k}$

(c) $-12\hat{i} + 9\hat{j} - 16\hat{k}$

(d) $3\hat{i} + 4\hat{j} + 7\hat{k}$

100. If $\phi(x, y, z) = x^2yz - 4xyz^2$, then directional derivative of ϕ at $(1, 3, 1)$ in the direction of $2\hat{i} - \hat{j} - 2\hat{k}$ is

(a) 10

(b) -10

(c) -11

(d) 11

★★★