Code No.	L – 4033

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2021

CSS

DATA SCIENCE

General Instructions

1. The Question Paper is having two Parts — Part 'A' Objective type (60%) & Part 'B' Descriptive type (40%).
2. Objective type questions which carry 1 mark each are to be (✓) 'tick marked' in the response sheets against the appropriate answers provided.
3. 8 questions are to be answered out of 12 questions carrying 5 marks each in Part 'B'.
4. **Negative marking** : 0.25 marks will be deducted for each wrong answer in Part 'A'.

Time : 2 Hours **Max. Marks : 100**

To be filled in by the Candidate									
Register Number	in Figures								
	in words								

PART – A

(Objective Type)

Choose appropriate answer from the options in the questions. **One** mark **each**.

(60 × 1 = 60)

1. Let a, b, c be in A.P., then $\frac{a}{bc}, \frac{1}{c}, \frac{1}{b}$ are

   a) in A.P. b) in G.P.

   c) in H.P. d) None of these

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2. The harmonic mean of two numbers is 4 and the arithmetic and geometric mean satisfy the relation $2A + G^2 = 27$, the numbers are

   a) 6, 3 b) 5, 4 c) 5, –2.5 d) –3, 1

3. If a, b, c are in A.P. as well as in G.P., then

   a) $a = b \neq c$ b) $a \neq b = c$

   c) $a \neq b \neq c$ d) $a = b = c$

4. If product of three consecutive terms of a G.P. is 216 and the sum of the products *of* them in pairs is 156. Find the number is

   a) 2, 6, 18 b) 3, 6, 12 c) 6, 12, 24 d) 6, 18, 9

5. If a, b, c are in A.P. and a^2, b^2, c^2 are in H.P. then

a) $a = b = c$
b) $a/2, b, c$ are in H.P
c) $a/2, b, c$ are in A.P.
d) None of these

6. If sum of three terms which are in A.P. is 18, then the common difference is

a) 3
b) 6
c) 5
d) cannot be determined

7. The value of $\begin{bmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{bmatrix}$ is

a) $a+b+c$
b) 0
c) 1
d) abc

8. For any square matrix $A, A + A^T$ will be

a) the identity matrix
b) a diagonal matrix
c) a symmetric matrix
d) a skew-symmetric matrix

9. If A is an invertible matrix then $(A^T)^{-1} =$

a) $(A^{-1})^T$
b) A^T
c) A^{-1}
d) None of the above

10. The multiplicative inverse of the matrix $\begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$ is

a) $\begin{bmatrix} -3 & -4 \\ -2 & -3 \end{bmatrix}$
b) $\begin{bmatrix} 3 & -4 \\ -2 & 3 \end{bmatrix}$
c) $\begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix}$
d) $\begin{bmatrix} \frac{1}{2} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{3} \end{bmatrix}$

11. If P is an invertible matrix and $A = PBP^{-1}$, which of the following is true?

a) $A = B$ b) $|A| = |B|$ c) $A = B^T$ d) $A = B^{-1}$

12. Let A and B be two square matrices of same order. Then $(A+B)^2 = A^2 + 2AB + B^2$ if and only if

a) $AB = I$ b) $BA = I$

c) $AB = BA$ d) None of these

13. If $A = [x \quad y \quad z]$, then

a) $A^T A$ is a 3×3 matrix b) AA^T is a 3×3 matrix

c) $A^T A$ is a 3×1 matrix d) AA^T is a 3×1 matrix

14. Find the value of determinant $\begin{bmatrix} a-b & b-c & c-a \\ x-y & y-z & z-x \\ p-q & q-r & r-p \end{bmatrix}$

a) 0 b) 1

c) $(a-b)(y-z)(r-p)$ d) None of the above

15. The equations $x + y = 2$ and $2x + 2y = 3$ have

a) a unique solution b) finitely many solutions

c) infinitely many solutions d) no solution

16. If *a* and *b* are natural numbers such that, $a^2 - b^2$ is a prime number then

a) $a^2 - b^2 = 0$ b) $a^2 - b^2 = 1$

c) $a^2 - b^2 = a + b$ d) $a^2 - b^2 = a - b$

17. The GCD and LCM of two numbers are 4 and 48 respectively. If their sum is 28, find the numbers.

a) 12, 24 b) 12,16 c) 16, 24 d) 4, 48

18. If fog is $g(f(x))$, given $f(x) = \sin x$ and $g(x) = x^2$, what is fog?

a) $\sin x^2$ b) $(\sin x)^2$ c) $x^2 \sin x$ d) $(\sin x^2)^2$

19. Which of the following is an even function?

a) $f(x) = x^3$ b) $f(x) = \sin x$

c) $f(x) = |x|$ d) $f(x) = ax + b$

20. Which of the following is an injuctive function R?

a) $f(x) = x^3$ b) $f(x) = \sin x$

c) $f(x) = |x|$ d) $f(x) = ax + b$

21. Which of the following statement is true?

a) Every relation is a function b) Every function is a relation

c) Both the above d) None of the above

22. Find the inverse of $f(x) = \dfrac{x}{1-2x}$

a) $g(y) = \dfrac{1-2y}{y}$ b) $g(y) = \dfrac{1+2y}{y}$

c) $g(y) = \dfrac{y}{1-2y}$ d) $g(y) = \dfrac{y}{1+2y}$

23. The range of the function $f(x) = \sqrt{x}$ defined on R is

a) R b) R^+ c) C d) None of these

24. Which of the following statement about the functions is true?

a) A function is injuctive, if it is bijective

b) A function is injective, if it is surjective

c) A function is bijective, if it is surjective

d) A function is surjective, if it is injective

25. If $f(x) = x^2 + 1$, find $f^{-1}(17)$

a) 4 b) $\sqrt{18}$ c) $\{3,-3\}$ d) $\{4,-4\}$

26. Evaluate $\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$

a) 4
b) 0
c) infinity
d) cannot be determined

27. $\lim_{x \to 0} \frac{\sin x}{x} =$

a) 0
b) 1
c) infinity
d) $\cos x$

28. If f and g are continuous then

a) $f + g$ is continuous
b) $f - g$ is continuous
c) $f.g$ is continuous
d) all of the above

29. If f is continuous then

a) f is integrable
b) f is differentiable
c) both (a) and (b)
d) None of the above

30. Which of the following is a bijection?

a) $f(x) = x^2$
b) $f(x) = \sin x$
c) $f(x) = x$
d) $f(x) = c$, where c is a constant

31. If $x^3 + y^3 = 3xy$, then $\frac{dy}{dx} =$

a) $\frac{x - y^2}{x^2 - y}$
b) $\frac{x - y^2}{y - x^2}$
c) $\frac{x^2 - y}{x - y^2}$
d) $\frac{x^2 - y}{y^2 - x}$

32. Derivative of e^{-x} is

a) e^{-x}
b) e^{x}
c) $-e^{-x}$
d) $-e^{x}$

33. The nth derivative of e^{ax} is

a) e^{ax} b) $a^n e^{ax}$ c) ae^{nx} d) ne^{ax}

34. If x is real, the maximum value of $5 + 4x - 4x^2$ is

a) 1 b) 2 c) 5 d) 6

35. The maximum slope of the curve $y = -x^3 + 3x^2 + 9x - 27$ is

a) –16 b) –6 c) 1 d) 12

36. How many subsets can be formed from the set $\{x, y, z\}$?

a) 3 b) 5 c) 8 d) 9

37. For any two sets A and B, $A - B =$

a) $A \cap B$ b) $A \cap B^c$ c) $A^c \cap B$ d) $A^c \cap B^c$

38. If two sets A and B contain 3 and 6 elements respectively, then what is the minimum number of elements in $A \cup B$?

a) 3 b) 6 c) 9 d) 4

39. What is the binomial expansion of $(1 - x)^{-1}$?

a) $1 - x + x^2 - x^3 + \cdots$ b) $1 + x + x^2 + x^3 + \cdots$

c) $1 + 2x + 3x^2 + \cdots$ d) $1 + x + \frac{x^2}{2} + \cdots$

40. For any $n > r$, if $C(n, r)$ denotes the number of combinations of n objects taken r at a time, Which of the following is true?

a) $C(n, r) = C(n + 1, r + 1)$ b) $C(n, r) = C(n + 1, r - 1)$

c) $C(n, r) = C(n, n - r)$ d) None of these

41. $C(n, r) + C(n, r - 1) =$

a) $C(n + 1, r)$ b) $C(n + 1, r - 1)$

c) $C(n, r + 1)$ d) None of the above

42. $\int \frac{1}{\sqrt{1-x^2}} dx =$

a) $\sin^{-1} x + c$
b) $\cos^{-1} x + c$
c) Both (a) and (b)
d) None of the above

43. Which of the following statements is true?

a) $(A-B) \cap (B-A) = \varphi$
b) $(A-B) \cap (B-A) = U$
c) $(A-B) \cap (B-A) = A$
d) $(A-B) \cap (B-A) = B$

44. $A - (B \cap C) =$

a) $A - B \cup C$
b) $B \cup C - A^c$
c) $(A-B) \cup (A-C)$
d) $(A-B) \cap (A-C)$

45. The relation n is a factor of m is

a) reflexive and symmetric
b) transitive and symmetric
c) reflexive, symmetric and transitive
d) reflexive and transitive, but not symmetric

46. Which of the following is true?

a) R and S are transitive $\Rightarrow$ R $\cup$ S is transitive
b) R and S are transitive $\Rightarrow$ R $\cap$ S is transitive
c) R and S are reflexive $\Rightarrow$ R $\cap$ S is reflexive
d) R and S are symmetric $\Rightarrow$ R $\cup$ S is symmetric

47. Which of the following is an equivalence relation?

a) aRb if and only if *a* divides *b*
b) aRb if and only if *a* greater than or equal to *b*
c) aRb if and only if *a* congruent to *b* modulo *n*, for a fixed number *n*
d) None of these

48. Which of the following is anti-symmetric relation?

a) aRb if and only if *a* divides *b*

b) aRb if and only if *a* greater than *b*

c) aRb if and only if *a* congruent to *b* modulo *n,* for a fixed number *n*

d) None of these

49. Out of 80 pupils who scored first class in Mathematics or English, 50 obtained first class in Mathematics and 10 obtained first class in both English and Mathematics. How many scored first class in English, but not in Mathematics?

a) 40 b) 30 c) 70 d) 60

50. A dice is tossed twice. The probability of having a number greater than 4 on each toss is

a) $\frac{1}{9}$ b) $\frac{1}{12}$ c) $\frac{1}{4}$ d) $\frac{2}{3}$

51. What is the probability that a non-leap year contains 53 Sundays?

a) $\frac{1}{365}$ b) $\frac{53}{365}$

c) $\frac{1}{7}$ d) $\frac{6}{7}$

52. Two cards are drawn successively with replacement from a well shuffled deck of 52 cards. What is the probability of drawing two aces?

a) $\frac{1}{13} \times \frac{1}{13}$ b) $\frac{1}{52} \times \frac{1}{52}$

c) $\frac{4}{52} \times \frac{3}{51}$ d) $\frac{2}{13}$

53. Let A and B be two events such that $P(A) = 0.8$, $P(B) = 0.6$ and $P(A \cap B) = 0.5$. Find the value of $P(A \cup B)$.

a) 0.9 b) 0.6 c) 1.4 d) 0.3

54. Let A and B be two events such that $P(A) = 0.8$, $P(B) = 0.6$ and $P(A \cap B)$=0.5. Find the value of $P(B / A)$.

a) 0.9 b) 0.67 c) 0.83 d) 0.3

55. Which of the following is a tautology?

a) $p \rightarrow q$ b) $p \ v \ q \rightarrow p$

c) $(p \rightarrow q) \rightarrow (q \rightarrow p)$ d) $p \ v \ p^c$

56. What is the truth value of $p \ v \ q$, when the truth value of p is 0 and q is 1?

a) 0 b) 1

c) can not be determined d) data incomplete

57. What is the binary number equivalent to 7?

a) 100 b) 111 c) 1000 d) 110

58. Given ‘‘All girls are Black’’ and ‘‘All Black are beautiful’’. If A is not Black then

a) A is not beautiful b) A is not girl

c) A is not girl and not beautiful d) A is not girl, but beautiful

59. X is taller than Y, Y is taller than A, B is taller than Y and Z is taller than B. Then

a) X is taller than B b) X is shorter than B

c) Y is shorter than Z d) Y is taller than Z

60. If prime (x) is a function which returns true when x is prime, what will be the value of m at the end of

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m = 0
for (i=10, i <=20, i++)
{
        if (prime i)
        m=m+1
}
```

a) 3 b) 4 c) 5 d) 6

ANSWER SHEET — P ART – A

1	A	B	C	D	E	21	A	B	C	D	E	41	A	B	C	D	E
2	A	B	C	D	E	22	A	B	C	D	E	42	A	B	C	D	E
3	A	B	C	D	E	23	A	B	C	D	E	43	A	B	C	D	E
4	A	B	C	D	E	24	A	B	C	D	E	44	A	B	C	D	E
5	A	B	C	D	E	25	A	B	C	D	E	45	A	B	C	D	E
6	A	B	C	D	E	26	A	B	C	D	E	46	A	B	C	D	E
7	A	B	C	D	E	27	A	B	C	D	E	47	A	B	C	D	E
8	A	B	C	D	E	28	A	B	C	D	E	48	A	B	C	D	E
9	A	B	C	D	E	29	A	B	C	D	E	49	A	B	C	D	E
10	A	B	C	D	E	30	A	B	C	D	E	50	A	B	C	D	E
11	A	B	C	D	E	31	A	B	C	D	E	51	A	B	C	D	E
12	A	B	C	D	E	32	A	B	C	D	E	52	A	B	C	D	E
13	A	B	C	D	E	33	A	B	C	D	E	53	A	B	C	D	E
14	A	B	C	D	E	34	A	B	C	D	E	54	A	B	C	D	E
15	A	B	C	D	E	35	A	B	C	D	E	55	A	B	C	D	E
16	A	B	C	D	E	36	A	B	C	D	E	56	A	B	C	D	E
17	A	B	C	D	E	37	A	B	C	D	E	57	A	B	C	D	E
18	A	B	C	D	E	38	A	B	C	D	E	58	A	B	C	D	E
19	A	B	C	D	E	39	A	B	C	D	E	59	A	B	C	D	E
20	A	B	C	D	E	40	A	B	C	D	E	60	A	B	C	D	E

DATA SCIENCE

PART – B

(Descriptive Type)

Answer **any Eight** questions. **(8 × 5 = 40 Marks)**

1. In a sequence of 4 numbers, the first three are in G.P and the last three are in A.P. with common difference 6. If first number is same as fourth number, find the numbers.

2. If a, b, c are in H.P., show that if $a > c$ then $\frac{1}{b-c} + \frac{1}{a-b} > \frac{4}{a-c}$.

3. Solve the system of linear equations: $2x + 3y - z = 9$,

$$3x - 4y + 2z = 2$$

$$x - 3y + 3z = 5$$

4. Prove that $\log_c(ab) = \log_c a + \log_c b$.

5. Find the maximum and minimum values attained by the function $f(x) = x^2 - 3x + 3$ in the region [0, 3].

6. Evaluate $\int x^3 e^{x^2} dx$.

7. 3 women and 5 men are to sit in a row for a dinner. In how many ways they can be arranged so that no two women sit next to each other?

8. Find the number of combinations of the word INDEPENDENCE taken 4 at a time.

9. X and Y appears for an interview for two vacancies in the same post. The probability that X gets selected is $\frac{1}{7}$ and that of Y is $\frac{1}{5}$. Find the probability that only one of them will be selected.

10. Out of 21 tickets numbered 1 to 21, three tickets are drawn at random. Find the probability that the numbers are in A.P.

11. Prove that $(p \to q) \cup (q \to r) = p \to r$.

12. Write an algorithm to check whether a given number is prime or not.