



BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY|CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

MID-TERM EXAMINATION 2023-24

APPLIED MATHEMATICS (241)



Class : 11 com.
Date : 13/10/23
Admission No.:

Duration: 3 Hrs
Max. Marks: 80
Roll No.:

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there is some Internal choice in some questions.
2. Section A has 18 MCQ's and 02 Assertion Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA) questions of 2 marks each.
4. Section C has 6 Short Answer (SA) questions of 3 marks each.
5. Section D has 4 Long Answer (LA) questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub Parts.
7. Internal Choice is provided in 2 questions in Section-B, 2 questions in Section-C, 2 Questions in Section-D. You have to attempt only one alternatives in all such questions.

SECTION A

(Multiple Choice Questions)

Each question carries 1 mark

1. Which of the following binary numbers is equivalent to decimal number 24?
a) 1101111 b) 11000 c) 111111 d) 11001
2. The decimal equivalent of the binary number 10101 is
a) 21 b) 12 c) 22 d) 31
3. The value of radix in binary number system is
a) 1 b) 2 c) 8 d) 10
4. The value of $\sqrt[4]{(81)^{-2}}$ is
a) $\frac{1}{9}$ b) $\frac{1}{3}$ c) 9 d) $\frac{1}{81}$
5. If $\log_{0.5} 64 = x$, then the value of x is
a) -4 b) -6 c) 4 d) 6
6. The value of $2 + \log_{10}(0.01)$ is
a) 4 b) 3 c) 1 d) 0
7. If each observation of the data is increased by 5, then their mean
a) Remain the same b) becomes 5 times c) is decreased by 5 d) is increased by 5
8. A can do a piece of work in 9 days and B can do the same work in 18 days. They begin together but A goes away after three days of beginning. The number of days in which B can finish the remaining work is
a) 6days b) 8days c) 9days d) 12 days
9. Two trains running in opposite directions at the speed of 36 km/hr and 54 km/hr cross each other in 8 sec. If the length of first train is 80m, then the length of second train is
a) 90m b) 100m c) 110m d) 130m

10. Which of the following is finite set?
 a) $\{x: x = 2n, n \in \mathbb{N}\}$ b) $\{x: x \text{ is a prime number}\}$ c) $\{x: x \in \mathbb{N}, x \text{ is a factor of } 128\}$
 d) $\{x: x \in \mathbb{I}, x \leq 7\}$
11. Two finite sets A and B are such that $A \subset B$, then which of the following is not correct?
 a) $A \cup B = B$ b) $A \cap B = A$ c) $A - B = \emptyset$ d) $B - A = \emptyset$
12. If $A = \{a, b\}$ and $B = \{x, y, z\}$, then the number of relations from B to A is
 a) 8 b) 16 c) 32 d) 64
13. In an A.P the pth term is q and the $(p+q)$ th term is 0, then the qth term is:
 a) $-p$ b) p c) $p+q$ d) $p-q$
14. If 3rd, 8th and 13th term of a G.P are p, q and r respectively, then which one of the following is correct?
 a) $q^2 = pr$ b) $r^2 = pq$ c) $pqr = 1$ d) $2q = p+r$
15. How many two digit number are divisible by 4?
 a) 21 b) 22 c) 24 d) 25
16. The number of 3 digit odd numbers, when repetition of digits is allowed is
 a) 450 b) 360 c) 400 d) 420
17. The number of 4 digit numbers that can be formed with the digits 2,3,4,7 and using each digit only once is
 a) 120 b) 96 c) 24 d) 100
18. There are 10 lamps in a hall. Each one of them can be switched on independently. The number of ways in which the hall can be illuminated is
 a) 2^{10} b) $2^{10}-1$ c) 10^2 d) 10^2-1

ASSERTION REASON BASED QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices

- a. Both A and R are true and R is the correct explanation of A.
 b. Both A and R are true and R is not the correct explanation of A.
 c. A is true but R is false.
 d. A is false but R is true.

19. Assertion (A): If the average of 3, 1, 5, x and 9 is 4 then value of x is 2.
 Reason (R): Average is sum of all observation divided by number of observation.
20. Assertion (A): The sum of 11 terms of an A.P. whose 6th term is 5 is 55.
 Reason (R): Sum of nth terms of an A. P. is $a + (n-1)d = a_n$.

SECTION B

[This section comprises of very short answer type questions (VSA) of 2 marks each]

21. Simplify: $\frac{5^{n+2} - 6 \cdot 5^{n+1}}{13 \cdot 5^n - 2 \cdot 5^{n+1}}$
22. A can complete $\frac{1}{5}$ of a piece of work in 12 hours and B can complete $\frac{1}{6}$ of the same work in 15 hours. In how many hours both working together can complete the work?
 OR
 A, B and C working separately can do a work in 2, 3 and 4 days respectively. If they all work together and earn Rs. 3900 for the whole work, how should they divide the money?
23. If A and B are two sets and U is the universal set such that $n(U) = 700$, $n(A) = 290$, $n(B) = 240$ and $n(A \cap B) = 110$, then find $n(A' \cap B')$.

24. Find the 20th term of the sequence $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \dots$.

OR

Find the sum to n terms of the A.P. whose kth term is $5k+1$.

25. Find the value of $\frac{9!}{6! \times 3!}$.

SECTION C

[This section comprises of short answer type questions (SA) of 3 marks each]

26. Subtract the following Binary number: 11010 from 110101.

OR

Convert the following decimal number to the binary numbers: 781

27. Find the value of x if $\log_{10} x - \log_{10}(2x - 1) = 1$.

28. A boy goes to school at 10 km/hr and returns back at 6 km/hr. find his average speed?

OR

Pankaj covers first 100km in 3 hrs and next 180km in 4 hrs. Find his average speed.

29. A and B are two sets such that $n(A-B) = 14+x$, $n(B-A) = 3x$ and $n(A \cap B) = x$. If $n(A) = n(B)$, find the value of x, (ii) $n(A \cup B)$.

30. Find the sum of first n term of the series; $5+55+555+\dots$.

OR

Given a G.P. with $a=729$ and 7th term is 64, determine S_7 .

31. What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) cards are of the same suit, (ii) cards are of the same colour.

SECTION D

[This section comprises of long answer type questions (LA) of 5 marks each]

32. Evaluate the following using log table: $\frac{(42.87)^{1/2} \times 84.9}{0.234}$.

33. A and B together can build a wall in 30 days. If A is twice as good a workman as B, in how many days will A alone finish the work?

OR

If 2 men or 3 boys take 40 hours to do a certain piece of work, how long will 4 men and 9 boys working together take to complete the work?

34. The ratio of the sums of m and n terms of an A.P. is $m^2:n^2$. Show that the ratio of mth and nth terms is $(2m-1):(2n-1)$.

OR

If a, b, c are in G.P. and $a^{1/x} = b^{1/y} = c^{1/z}$, prove that x,y,z are in A.P.

35. Find r if ${}^9C_r - {}^8C_r = {}^8C_2$.

SECTION E

[This section comprises of 3 case- study/passage based questions of 4 marks each with sub parts. The first two case study questions have three sub parts (i), (ii), (iii) of marks 1, 1,2 respectively. The third case study question has two sub parts of 2 marks each.]

36. In a class of 90 students, children play football, cricket and badminton. 55 play cricket, 53 play football, 35 play badminton. 25 play cricket and football, 13 play cricket and badminton and 3 play

all 3 sports. The school plans to award certificates to all the students in the class for each of the sports they played. On the basis of above information answer the following questions:



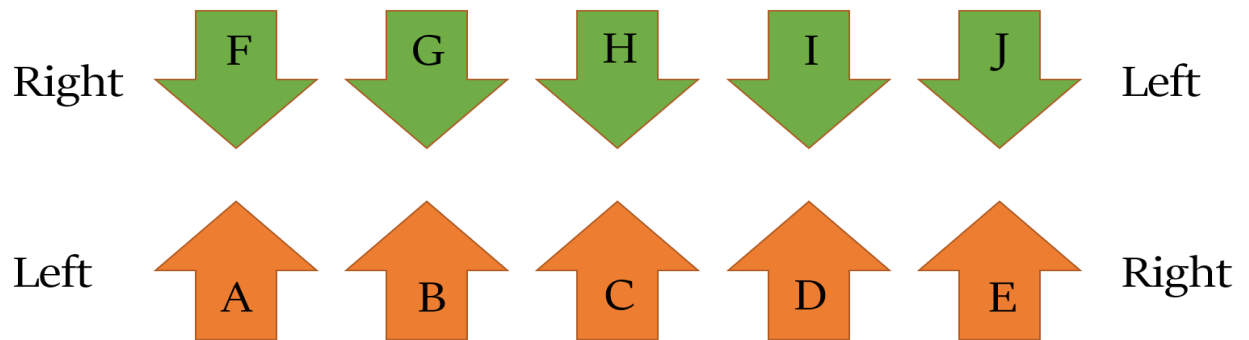
1. How many children will get a certificate for cricket only?
 - a) 10
 - b) 20
 - c) 30
 - d) 40
2. How many children will get a certificate for only football?
 - a) 13
 - b) 14
 - c) 15
 - d) 16
3. How many children will get a certificate for football and badminton?
 - a) 9
 - b) 10
 - c) 11
 - d) 12

37. Rohan want to create a pass-code for his phone using four numbers.



1. In how many ways can the numbers 1, 5, 7 and 8 be arranged to form one? (Numbers cannot be repeated).
 - a) 24
 - b) 25
 - c) 26
 - d) 27
 2. If the pass code had to be found to be formed with only 3 numbers, in how many ways could that be done?(numbers cannot be repeated)
 - a) 20
 - b) 22
 - c) 24
 - d) 26
 3. In how many ways could a five numbers pass code be made if the number 9 was also added to the set of numbers that can be used? (numbers cannot be repeated)
 - a) 80
 - b) 120
 - c) 160
 - d) 200
38. Read the following instruction carefully and answer the questions given below it:

Eleven friends A,B,C,D,E,F,G,H,I,J and K are watching a movie in a cinema hall sitting in a row. H is immediate left of D and third to the right of I. J is the immediate neighbour of A and B and third to the left of G. A is the second to the right of E who is at one end of the row. F is sitting next to the right of D and D is second to the right of C.



(This image is demo not for reference of above question).

1. Write the seating arrangement.

a) ABCDEFGHIJK	b) BCEADFHIFJK	c) EKAJBIGCHDF	d) FDGHJKIABCE
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2. Who is sitting at the centre of row?

a) A	b) B	c) I	d) G
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3. Who are the neighbours of H?

a) A and B	b) C and D	c) G and H	d) Hand I
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End of Paper
