BK BIRLA CENTRE FOR EDUCATION

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

ANNUAL EXAMINATION- 2025-26

APPLIED MATHEMATICS (241)

Class : 11B. Duration: 3hrs
Date : 18 /02/25 Max. Marks: 80
Admission No.: Roll No.:

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices 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)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment of 4 marks each with Sub-parts.

SECTION A

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. $\sqrt[4]{\sqrt[3]{2^2}}$ is equal to
   a) $2^{-1/6}$ b) 2^{-6} c) $2^{1/6}$ d) 2^6
3. If $\log_{0.5}(0.04)=x$, then the value of x is:
   a) 2 b) 4 c) -4 d) -2
4. Walking at 6/7th of his usual speed a man is 12 minute late. The usual time to cover the distance is:
   a) 1hour 12min b) 1hour 20min c) 48 min. d) 1 hour
5. If R= $\{(x,y): x,y \in N, x+2y=21\}$, then the range of R is:
   a) $\{1,2,3,\ldots,7,8\}$ b) $\{1,2,3,\ldots 9,10\}$ c)$\{1,3,5,7\ldots 19\}$ d) $\{1,35,7,\ldots.15\}$
6. If 9 times the 9th term is equal to 13 times the 13th term , then the 22nd term of the A.P is:
   a) 0 b) 22 c) 220 d) 198
7. If the second term of G.P is 2 and the sum of its infinite terms is 8, then G.P is :
   a) 8,2,1/2,1/8,... b)10,2,2/5,2/25,... c) 4,2,1,1/2,1/4... d) 6,3,3/2,3/4,...
8. The number of six digit numbers that can be formed by using the digits 1,2,1,2,0,2 is:
   a) 50 b) 60 c)110 d) 10
9. Everybody in a room shakes hands with everybody else. The total number of handshakes is 66. The total numbers of person in room is:
   a) 11 b) 12 c) 13 d) 14
10. The domain of the function f defined by f(x) = $\sqrt{a^2-x^2}$ (a> 0) is :
    a) (-a,a) b) $[-a,a]$ c) $[0,a]$ d) $(-a,0]$
11. Let A be a finite set containing 3 elements, then the number of function from A to A:
    a) 512 b) 511 c) 27 d) 26
12. If f(x)= px+q, where p and q are integers, f(-1)=1and f(2)=13, then p and q are:
    a) P=4,q=5 b) p=-4,q=5 c)p=-4,q=-5 d) p=4,q=-5

13. $\lim_{x\to 2} \frac{\log(x-1)}{x-2}$ is equal to:
    a) 0 b) -1 c) 1/2 d) 1
14. $\lim_{x\to 0} \frac{|x|}{x}$ is equal to:
    a) 1 b) -1 c)0 d) Does not exist
15. If y= $\sqrt{x}+\frac{1}{\sqrt{x}}$, then $\frac{dy}{dx}$ at x=1 is
    a) 1 b) 1/2 c)$1/\sqrt{2}$ d) 0
16. If P(A) =7/13, P(B)= 9/13 and P(A∩B) = 4/13 , then P(A'/B) is equal to:
    a) 6/13 b) 5/13 c)4/9 d) 5/9
17. The variance of first 5 natural numbers:
    a) 1 b) 2 c)3 d)
18. Health and education cess payable on :
    a) Gross Income b) Taxable Income c)Income Tax d) Education loan

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 but 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): The points A (-2, 1), B (0, 5), C (-1, 2) are collinear.
    REASON(R): Three points are collinear if and only if AB+BC=AC.
20. ASSERTION (A): If f(x) = $1-x+x^2-x^3+\ldots-x^{99}+x^{100}$, f' (1) = 50.
    REASON (R): f' (x^n) = nx^{n-1}.

SECTION B

Each question carries 2 mark

21. Solve: $16^{x+1} = \frac{64}{4^x}$.
22. By walking at ¾ of his usual speed, a man reaches his office 10 minutes late than his usual time. Find the usual time taken by him to reach his office.
23. If f(x) =$\frac{x-1}{x+1}$, show that f ($\frac{x-1}{x+1}$) $= -\frac{1}{x}$.
24. Differentiate the following w.r.t x: f(x) = $\frac{2(x+1)}{x^2+2x-3}$.

    OR

    Differentiate$\sqrt{1+x^2}$ w.r.t.x
25. Find y if the slope of the line joining (-8, 11) and (2, y) is $-\frac{4}{3}$.

    OR

    Find the value of x for which the point (x,-1), (2, 1) and (4, 5) are collinear.

SECTION C

Each question carries 3 mark

26. In a flight of 600km, an aircraft was slowed down due to bad weather. The average speed of the aircraft for the trip was reduced by 200km/hr and the time of the flight increased by 30 minutes. What is the actual duration of the flight?

    OR

A can do a piece of work in 12 days and B can do the same work in 16 days. A started the work alone. After how many days should B join him, so that the work is finished in 9 days?

27. If A=$\{4,5,8,12\}$, $B = \{1,4,6,9\}, C = \{1,2,3,4\}$, then find (i) A-(B-A), (ii) A-(C-B).
28. Find the domain and range of the following function, f(x) =$\sqrt{9-x^2}$.

OR

Find the domain and range of the following function, f(x) = $\frac{x^2-1}{x-1}$.

29. Evaluate the following limit: $\lim_{x\to 0} \frac{\sqrt{1+x^2}-\sqrt{1+x}}{x}$.

OR

If the function f(x) = $\begin{cases} 3ax+b\,, & x>1 \\ 11, & x=1 \\ 5ax-2b, & x<1 \end{cases}$, is continuous at x=1, find the values of a and b.

30. Two-third of the students of a class are boys and the rest are girls. It is known the probability of a girl getting a first class marks in Board's Exam is 0.4 and a boy getting first class marks is 0.35. Find the probability that a student's chosen at random will get first class marks in Exam.
31. Find the equation of the circle which passes through the point (2,4) and centre at the intersection of the lines x-y=4 and 2x+3y+7=0

SECTION D

<u>Each question carries 5 mark</u>

32. In a test, an examinee either guess or copies or knows the answer to a multiple choice question with four choices and only one correct option. The probability that he makes a guess is 1/6. The probability that he copies the answer is 1/9. The probability that the answer is correct, given that the copied it, is 1/8. Find the probability that he knew the answer to the question, given that he correctly answered it.

OR

A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

33. The following table gives information regarding weekly income of labourers working at a dam site:

Income(Rs)	600-700	700-800	800-900	900-1000	1000-1100	1100-1200	1200-1300
No. of labourers	40	68	86	120	90	40	26

Estimate: (i) median, (ii) Lower Quartile, (iii) Upper Quartile.

OR

Calculate the mean, Variance and standard deviation of the following data:

Classes	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

34. Mukesh borrows Rs. 20000 on condition to repay it with compound interest at 5% p.a. by annual instalment of Rs. 2000 each. In how many years will the debt be paid off?

OR

Find the present value of a regular annuity of Rs 1000 payable for 3 years at 12% per annum compounded annually.

35. A shopkeeper sells an article at the listed price of Rs. 1500. The rate of GST on the article is 18%. If the sales are intra-state and the shopkeeper pays a tax (under GST) of Rs.27 to the central government, find the amount inclusive of tax at which the shopkeeper purchased article from the wholesaler.

SECTION E

Each question carries 4 mark

(This section comprises of with two sub-parts. First two case study questions have three sub of marks 1, 1, 2 respectively. The third case study question has two sub marks each.)

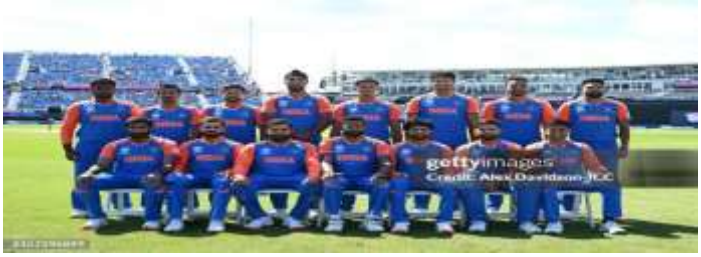
36. Read the following information carefully and answer the questions given below:
Eleven friends A,B,C,D,E,F,G,H,I,J and K are watching a movie in a cinema hall sitting in a row. H is immediate left of D and third to the right of I. J is the immediate neighbour of A and B and third to the left of G. 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.
On the basis of above information, answer the following questions.

i) Write the sitting arrangement.
ii) Who is sitting at the centre of row?
iii) Who are the neighbours of H?

37. In a University, out of 100 students 15 offered Mathematics only; 12 offered statistics only; 8 offered only Physics and Mathematics; 20 offered Physics and Statistics; 10 offered Mathematics and Statistics; 65 offered Physics. Draw the proper Venn diagram. find the number of students who:
On the basis of above information, answer the following questions.

i) The number of students who offered Mathematics.
ii) The number of students who offered Statistics.
iii) The number of students who did not offer any of the above three subjects.

38. A cricket team has 15 players in squad, in how many ways can final eleven be selected from 15 cricket player.
On the basis of above information, answer the following questions.



i) If there is no restriction.
ii) If one of them must be included.
iii) If one of them, who is in bad form, must always be excluded.
iv) If two of them being leg spinners, one and only one leg spinner must be included?

**********ALL THE BEST**********