INDIAN SCHOOL AL WADI AL KABIR

FINAL EXAMINATION (2022-23)

SUB: APPLIED MATHEMATICS (241)

Date: 28/02/2023   Time Allowed :3 hours

Class: XI   Maximum Marks: 80

General Instructions:

1. This question paper contains five sections A, B, C, D and E. Each section is compulsory.
2. Section - A carries 20 marks weightage, Section - B carries 10 marks weightage, Section - C carries 18 marks weightage, Section - D carries 20 marks weightage and Section - E carries 3 case-based with total weightage of 12 marks.
   Section – A:
3. It comprises of 20 MCQs of 1 mark each.
   Section – B:
4. It comprises of 5 VSA type questions of 2 marks each.
   Section – C:
5. It comprises of 6 SA type of questions of 3 marks each.
   Section – D:
6. It comprises of 4 LA type of questions of 5 marks each.
   Section – E:
7. It has 3 case studies. Each case study comprises of 3 case-based questions, where 2 VSA type questions are of 1 mark each and 1 SA type question is of 2 marks. Internal choice is provided in 2 marks question in each case-study.
8. Internal choice is provided in 2 questions in Section - B, 3 questions in Section – C, 2 questions in Section - D. You have to attempt only one of the alternatives in all such questions.

Q.No	SECTION-A	Marks
1	If A = ϕ, then the number of elements in the power set of A is a) 0　　　　　　b) 1　　　　　　c) ϕ　　　　　　d) 2	1
2	The simple interest for an amount of ₹10000 calculated for 6 years at 5% per annum is a) ₹3000　　　b) ₹6000　　　c) ₹2000　　　d) ₹2500	1
3	Which of the following is a null set? a) A = {x: x > 1 and x < 1 }　　　　　　b) B = {x: x + 3 = 3} c) C = { ϕ }　　　　　　　　　　　　d) A = {x: x ≥ 1 and x ≤ 1 }	1
4	If (2x – 5, 4) = (5, y + 6), then the values of x and y are a) x=5, y=2　　b) x= −5, y= −2　　c) x=5, y=-2　　d) x= −5, y=2	1
5	If $9^{2x} = \dfrac{1}{81}$, then the value of x is a) 2　　　　　　b) −1　　　　　　c) −2　　　　　　d) 0	1

6	The set of intelligent students in a class is a) a null set b) a singleton set c) a finite set d) not a well-defined collection	1
7	The average of 5 numbers is 30. If one number is excluded their average become 28. The number excluded is a) 38 b) 32 c) 22 d) 28	1
8	The number which should be added to the numbers 2, 14, 62, so that the resulting numbers be in GP, is a) -2 b) -1 c) 2 d) 0	1
9	If $^{n+1}C_3 = 2(^nC_2)$, then the value of n is a) 6 b)5 c) 4 d) 0	1
10	In a certain language, If BLOWN is coded as BLNOW then how will RIGHT be coded? a) HIRGT b) SJHIU c) GHIRT d) THIGR	1
11	$If \ y = (2x + 3)^{10}, then \ \frac{dy}{dx} \ at \ x = -1,$ is a) 20 b) -20 c) 10 d) -10	1
12	The number of 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated is a) 122 b) 100 c) 108 d) 212	1
13	Find the odd man out from the given alternatives. a) 34 b) 36 c) 30 d) 42	1
14	The median for the data 3, 5, 1, 2, 4, 6, 0, 2, 2, 3 is a)2 b) 2.5 c)3 d)3.5	1
15	If the third term of a GP is 2, then the product of its first five terms is a) 64 b) 2 c) 16 d) 32	1
16	Let A and B are two mutually exclusive events and if P(A) = 0.5 and P $(\bar{B})$ = 0.6, then P(A∪B) is equal to a) 1 b) 0.11 c)0.9 d) 1.1	1
17	The slope of the line 2x-3y-6 =0 is a) $\frac{2}{3}$ b) $\frac{-2}{3}$ c) $\frac{3}{2}$ d) $\frac{-3}{2}$	1
18	$If \ f(x) = \begin{cases} 3x + 1, & x < 0 \\ x^2, & 0 \le x \le 2 \\ 2x & x > 2 \end{cases}$, then f (-1) + f (1) − f (3) is a) 7 b) 5 c) -5 d) -7	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 correct and R is the correct explanation of A. b) Both A and R are correct but R is not the correct explanation of A. c) A is correct but R is incorrect. d) A is incorrect but R is correct.	

19	**Assertion:** The distance to the line 3x+4y -10 = 0 from the origin is 2 units **Reason:** The length of the perpendicular from the origin to the line $Ax + By + C = 0$ is $\dfrac{|c|}{\sqrt{A^2 + B^2}}$	1
20	**Assertion:** If the set A has 2 elements and the set B = {3, 4, 5}, then the number of relations from A to B is 32 **Reason:** If a set A has m elements and n has n elements, then the number of relations from A to B is 2^{mn}	1

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SECTION B
This section comprises of very short answer type-questions (VSA) of 2 marks each
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21	Reena completes her canvas painting in 4 days. Mihir finishes the same work in 5 days. If they work together then find out the number of days taken by them to finish it.	2
22	Find the domain and range of the real function $f(x) = -|x|$	2
23	Evaluate $\displaystyle\lim_{x \to 1}\dfrac{x^2+2x-3}{x^2+x-2}$ OR $f(x) = \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ a - bx, & x > 1 \end{cases}$ is continuous at x=1, then find the value of a and b	2
24	A family has two children. What is the probability that both the children are boys given that at least one of them is a boy? OR In a group of 100 sports car buyers, 40 bought alarm systems, 30 purchased bucket seats, and 20 purchased an alarm system and bucket seats. If a car buyer chosen at random, bought an alarm system, what is the probability they also bought bucket seats?	2
25	The difference between the compound interest and simple interest on a certain sum of money at 40% per annum for 2 years is 1000. Find the sum.	2

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SECTION C
(This section comprises of short answer type questions (SA) of 3 marks each)
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26	If $3^x = 9^y = 27^z$ and $xyz = 36$ (where x, y and z are positive integers) then show that $\sqrt{x^2 + y^2 + z^2} = 7$ OR If $\log_x(8x - 3) - \log_x 4 = 2$, then solve for x	3
27	Let U = {1, 2, 3, 4, 5, 6}, A = {2, 3} and B = {3, 4, 5}. i) Find A – B ii) Show that (A ∪ B) ′ = A′ ∩ B′.	3

28	How many three-digit numbers can be formed using the digits 0, 1, 3, 5 and 8.
	    (i) If repetition of digits is not allowed
	    (ii) If repetition of digits is allowed.
		3

| 29 | The test marks of 15 students out of 10 are given below: | | | | | | | | | | 3 |

Test marks	1	2	3	4	5	6	7	8	9	10
No: of students	1	2	1	1	2	2	5	0	1	0

Find the percentile rank of test marks 6.

OR

Find the correlation coefficient between X and Y when $\sum x = 125$, $\sum y = 100$, $\sum x^2 = 650$, $\sum y^2 = 464$, $\sum xy = 508$ and n = 25.

| 30 | If $y = (\sqrt{x} + x^2)(x^3 - 2)$, then find $\dfrac{dy}{dx}$ | 3 |

| 31 | Find the equation of the perpendicular bisector of the line segment joining the points A (2, 3) and B (6, –5)

OR

find the coordinates of the focus, the equation of the directrix and the length of the latus rectum of the parabola $x^2 = -9y$ | 3 |

SECTION D
(This section comprises of long answer-type questions (LA) of 5 marks each)

| 32 | | 5 |

Applicable Tax Rate

For the financial year 2020-21 (Assesment year 2021-2022) rate of income tax is as under

Slab	Income Tax Rate	Health and Education Cess
Upto 2.5 Lakh	Nil	4%
2.5 - 5.0 Lakh	5% of amount by which taxable income exceeds Rs 2,50,000	
5.0 - 7.5 Lakh	Rs 12500 + 10% (taxable income 2,50,000)	4%
7.5 - 10 Lakh	Rs 37500 + 15% (taxable income 7,50,000)	4%
10 - 12.5 Lakh	Rs 75000 + 20% (taxable income 10,00,000)	4%
12.5 - 15 Lakh	Rs 1,25000+25% (taxable income 12,50,000)	4%
Above 15 Lakh	Rs 187500 + 30% (taxable income 15,00,000)	4%

Exemptions and deductions:

(PF, PPF, LIC, HOUSING LOAN, FD, NSC)

Tax rebate under 87A up to ₹ 12, 500 for taxable income up to ₹ 5, 00, 000.

Ram's income from salary is ₹2,50,000. Income earned from House property rentals ₹ 1,00,000. Income under head Business and Profession, come out to be ₹ 2, 50, 000. Income under head capital gain is ₹ 1, 00, 000. PF contribution is ₹50,000, LIC is ₹ 50, 000. Calculate the income tax liability of Ram with reference to the tax rate given above.

33	Let A = $\{-3, -2. -1, 0, 1, 2, 3\}$ and B = $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$. A relation from A to B is defined as R= $\{(x, y): x \in A \text{ and } y \in B \text{ and } y = 9 - x^2\}$.
	
	    i) Represent the relation in Roster form.
	
	    ii) Represent R with an arrow diagram.
	
	    iii) Write its domain and range.
	
	    iv) Is the relation R a function, justify?
		5

34	The sum of three numbers in A.P. is 24 and their product is 440. Find the numbers. OR Find the sum of the sequence 4, 44, 444, ... to n terms.	5
35	Find the equation of the circle whose radius is 5 units, its centre lies on x–axis and passes through the point (2, 3). OR Find the equation of the circle passing through the points (4,1) and (6,5) and whose centre is on the line 4x + y = 16.	5
	SECTION E (All questions are compulsory. In case of internal choice, attempt any one question only)	
36	In a class of 25 students it was found that15 students read mathematics books, 12 students read physics books while 11 students read chemistry books. 5 students read both mathematics and chemistry, 9 students read physics and mathematics. 4 students read physics and chemistry and 3students read all three subject books. Based on the above information, answer the following questions.	
	i)Find the number of students who reads only chemistry book.	1
	ii)Find the number of students who reads only mathematics book.	1
	iii)Find the number of students who read exactly one of the given subjects. OR iii) The number of students who reads none of the given subjects.	2

37	A company produces 500 computers in the third year and 600 computers in the seventh year. Assume that the production increases uniformly by a constant number every year	
	Based on the above information, answer the following questions.	
	i)Find the the number of computers produced in the first year.	1
	ii) Find the the number of computers produced in the 21st year.	1
	iii)The difference in the number of computers produced in the 8th year and 12th year OR iii)Find the total production in the first ten years.	2
38	In a factory which manufactures bolts, machines A, B and C manufacture respectively 25%, 35% and 40% of the bolts. Of their outputs, 5, 4 and 2 percent are respectively defective bolts.	
	i)Find the probability of getting a defective bolt from Machine A.	1
	ii) Find the probability of getting a non-defective bolt from Machine C.	1
	iii)Find the total probability of getting a defective bolt. OR iii) A bolt is selected at random and found to be defective then what is the probability that it is manufactured by machine B?	2

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