



Indian School Al Wadi Al Kabir

Assessment 1

APPLIED MATHEMATICS (Code: 241)

Class : XI
Date : 20/09/2022

Time: 3 Hours
Max. Marks : 80

General Instructions:

1. This question paper contains six sections- A, B, C, D, E and F. Each part is compulsory.
2. Section - A has 16 objective type questions of 1 mark each.
3. Section - B has 8 MCQ type questions of 1 mark each.
4. Section - C has 2 Case based questions.
5. Section - D has 8 short answer type (SA1) questions of 2 marks each.
6. Section - E has 4 short answer type (SA2) questions of 3 marks each.
7. Section - F has 4 long answer type questions (LA) of 5 marks each.
8. There is an internal choice in some of the questions.

SECTION - A

1	If $A = \{1, 2, 3, \dots, 10\}$ and a relation R is defined from A to A by $R = \{(x, y) : 2x - y = 0, x, y \in A\}$ Write R in roster form	1
2	Let $A = \{1, 2, 3\}$, $B = \{2, 3, 4\}$, $C = \{3, 4, 5\}$, find $A \times (B \cap C)$	1
3	If $n(A) = 20$ and $n(B) = 30$ and $n(A \cup B) = 40$ then find $n(A \cap B)$	1
4	Find the mean deviation about the mean for the data: 1, 3, 7, 9, 10, 12 OR Find the mean deviation about the median for the data: 3, 6, 11, 12, 18	1
5	In a class test, the mean of marks scored by 40 students was calculated as 18.2. Later on, it was detected that the marks of one student was wrongly copied as 21 instead of 29. Find the correct mean.	1
6	Convert the decimal number 63 to the binary number. OR Convert the binary number $(1111010)_2$ to its equivalent decimal number.	1
7	If A has 5 elements B has 6 elements then find the minimum and maximum number of elements in $A \cup B$	1
8	Simplify $\left[8^{\frac{-4}{3}} \div 2^{-2}\right]^{1/2}$ OR Simplify $\frac{4a}{b^{-1}} + \frac{2b}{a^{-1}}$	1
9	A relation R is defined from the set of integers to the set of real numbers as $R = \{(x, y) : x^2 + y^2 = 16\}$ then find the domain of R	1

10	Convert $\log_3 81 = 4$ to exponential form	1
11	Write all the possible subsets of $A = \{-2, 3\}$.	1
12	The variance of 20 observations is 6. If each observation is multiplied by 2, then find the new variance of the resulting observations.	1
13	If $4^{2x} = \frac{1}{32}$, then find the value of x OR If $\sqrt{\left(\frac{3}{5}\right)^{1-2x}} = 4\frac{17}{27}$, then find the value of x	1
14	Find 'x' if $(x^2 - 6x, y^2 - y) = (-9, 6)$	1
15	What is the sum of the median and mean of the following data? 3, 5, 0, 4, 9, 7, 6, 3, 8	1
16	The scores of screening test conducted by a company for the post of manger are given below 48, 37, 35, 46, 39, 55, 89, 67, 55, 46 find the percentile rank of score 55	1

SECTION - B

17	Number of elements in the power set of $\{1, -1\}$ is (A) 2 (B) 4 (C) 3 (D) 6	1
18	If $A = \{x: x \in \mathbb{R}, x \geq 4\}$ and $B = \{x: x \in \mathbb{R}, x < 5\}$, then $A \cap B$ is (A) (4, 5) (B) (4, 5] (C) [4, 5) (D) [4, 5]	1
19	If $A = \{1, 2\}$ and $B = \{3, 4\}$, then the number of subsets of $A \times B$ is (A) 12 (B) 14 (C) 4 (D) 16	1
20	The mode of the data 3, 5, 1, 2, 4, 6, 0, 2, 2, 3 is (A) 2 (B) 3 (C) 4 (D) 6	1
21	The marks of 9 students in a test were 13, 17, 20, 5, 3, 3, 18, 15, and 20 then the first quartile Q_1 is (A) 15 (B) 19 (C) 4 (D) 6	1
22	The covariance between x and y when $\sum x = 50$, $\sum y = -30$, $\sum xy = 115$ and $n = 10$ is (A) 26.5 (B) 25 (C) 28.5 (D) 23	1
23	If $1176 = 2^p \cdot 3^q \cdot 7^r$, then the numerical value of p is (A) 2 (B) 3 (C) 1 (D) 0	1
24	If $\log_x 243 = -5$, then the value of x is (A) 3 (B) 2 (C) $\frac{1}{3}$ (D) $\frac{1}{2}$	1

SECTION - C

25	CASE-BASED/DATA-BASED	
	In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers.	
i)	Find the number of people who read at least one of the newspapers.	2
ii)	Find the number of people who read exactly one newspaper.	2

26	The mean of the product of deviation scores $(x_i - \bar{x})$ and $(y_i - \bar{y})$ is called covariance of X and Y Here given a set of X and Y values, use the data to answer the following questions															
	<table border="1"> <tr> <td>X</td> <td>15</td> <td>20</td> <td>25</td> <td>30</td> <td>40</td> <td>50</td> </tr> <tr> <td>Y</td> <td>44</td> <td>43</td> <td>45</td> <td>37</td> <td>34</td> <td>37</td> </tr> </table>	X	15	20	25	30	40	50	Y	44	43	45	37	34	37	
X	15	20	25	30	40	50										
Y	44	43	45	37	34	37										
i)	Find the mean of X values	1														
ii)	Find the mean of Y values	1														
iii)	Find $\sum (x_i - \bar{x})(y_i - \bar{y})$	1														
iv)	Find the covariance of x and y	1														

SECTION - D (Each question carries 2 marks)

27	Write the relation R defined on set A in roster form where $A = \{1, 2, 3, 4, 5\}$ and $R = \{(x, y) : x + y \leq 5, x, y \in A\}$. OR Two finite sets have m and n elements. The number of elements in the power set of the first set is 48 more than the total number of elements in the power set of the second set then, find the values of m and n.	2																										
28	Let $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8\}$. Find $A - B$ and $B - A$.	2																										
29	If $A = \{1, -3, -5\}$, $B = \{2, 3\}$ find i) $A \times B$ ii) $B \times A$	2																										
30	Add the following binary numbers and check the result by converting them to decimal system 10001 and 1101 OR Subtract the following binary numbers and check the result by converting them to decimal system 10000 from 10111	2																										
31	Find the value of x if $4^{2x} = \frac{1}{64}$	2																										
32	Solve for x if $\log_2(x^2 - 4) = 5$	2																										
33	The following data gives the information on the observed lifetimes (in hours) of 225 electrical components, find the modal lifetimes of the components. <table border="1"> <tr> <td>Life time (in hours)</td> <td>0 – 20</td> <td>20 – 40</td> <td>40 – 60</td> <td>60 – 80</td> <td>80 – 100</td> <td>100 - 120</td> </tr> <tr> <td>Frequency</td> <td>10</td> <td>35</td> <td>52</td> <td>61</td> <td>38</td> <td>29</td> </tr> </table> OR Find the mean deviation about the mean for the following data: <table border="1"> <tr> <td>x_i</td> <td>10</td> <td>30</td> <td>50</td> <td>70</td> <td>90</td> </tr> <tr> <td>f_i</td> <td>4</td> <td>24</td> <td>28</td> <td>16</td> <td>8</td> </tr> </table>	Life time (in hours)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 - 120	Frequency	10	35	52	61	38	29	x_i	10	30	50	70	90	f_i	4	24	28	16	8	2
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34	The test mark of 12 students are given 22, 23, 25, 22, 24, 27, 28, 24, 30, 33, 24, 27 find the percentile rank of 25 marks.	
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SECTION - E (Each question carries 3 marks)

35	In a Company the store supervisor and the purchase manager independently ranked its eight main suppliers (A, B, C, D, E, F, G and H) in order of value of the company, taking in to account such factors as reliability, volume, special discount and product quality. They ranked them as follows Calculate Spearman's rank correlation for the following data.	3																		
	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>Store supervisor</td> <td>E</td> <td>C</td> <td>G</td> <td>H</td> <td>B</td> <td>D</td> <td>A</td> <td>F</td> </tr> <tr> <td>Purchase Manager</td> <td>E</td> <td>G</td> <td>B</td> <td>D</td> <td>C</td> <td>A</td> <td>H</td> <td>F</td> </tr> </table>	Store supervisor	E	C	G	H	B	D	A	F	Purchase Manager	E	G	B	D	C	A	H	F	
Store supervisor	E	C	G	H	B	D	A	F												
Purchase Manager	E	G	B	D	C	A	H	F												
36	Prove that $\left(\frac{x^m}{x^n}\right)^{m+n} \cdot \left(\frac{x^n}{x^1}\right)^{n+1} \cdot \left(\frac{x^1}{x^m}\right)^{1+m} = 1$ OR If $abc = 1$ show that $\frac{1}{1+a+b^{-1}} + \frac{1}{1+b+c^{-1}} + \frac{1}{1+c+a^{-1}} = 1$	3																		
37	If $\log 7 - \log 2 + \log 16 - 2\log 3 - \log \frac{7}{45} = 1 + \log n$, find n OR If $3\log \sqrt{m} + 2\log \sqrt[3]{n} - 1 = 0$, find the value of $m^9 n^4$	3																		
38	If $L = \{1, 2, 3, 4\}$ and $M = \{3, 4, 5, 6\}$ and $N = \{1, 3, 5\}$, then verify that $L - (M \cup N) = (L - N) \cap (L - M)$	3																		

SECTION - F (Each question carries 5 marks)

39	$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{2, 3, 4, 5\}$, $B = \{3, 5, 7, 9\}$, $C = \{1, 3, 5, 7, 9\}$. Find (i) $A - (B \cup C)$, (ii) $(A - B) \cup (B - C)$ (iii) Verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$	5																												
40	If the relation $R = \{(0, 0), (2, 4), (-1, -2), (3, 6), (1, 2)\}$ i) Write the domain of R ii) Write the range of R iii) Write R in set builder form iv) Represent R by an arrow diagram	5																												
41	Find Karl Pearson's coefficient of correlation between X and Y for the following data	5																												
	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>X</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> </tr> <tr> <td>Y</td> <td>4</td> <td>2</td> <td>10</td> <td>8</td> <td>6</td> </tr> </table> <p style="text-align: center;">OR</p> <p>Find the mean, variance and standard deviation for the following data:</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>x_i</td> <td>4</td> <td>8</td> <td>11</td> <td>17</td> <td>20</td> <td>24</td> <td>32</td> </tr> <tr> <td>f_i</td> <td>3</td> <td>5</td> <td>9</td> <td>5</td> <td>4</td> <td>3</td> <td>1</td> </tr> </table>	X	5	4	3	2	1	Y	4	2	10	8	6	x_i	4	8	11	17	20	24	32	f_i	3	5	9	5	4	3	1	
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x_i	4	8	11	17	20	24	32																							
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42	Evaluate using logarithmic table $\frac{(42.87)^{\frac{1}{2}} \times 84.9}{0.234}$ OR $\sqrt{\frac{31.67 \times 42.36}{9.25}}$	5																												
