

Q10 Among these numbers tell which one is smallest:

$$3^{\frac{1}{3}}, \quad 5^{\frac{1}{5}}, \quad 2^{\frac{1}{3}}, \quad 3^{\frac{1}{5}}$$

a) $3^{\frac{1}{3}}$ b) $5^{\frac{1}{5}}$ c) $2^{\frac{1}{3}}$ d) $3^{\frac{1}{5}}$

Q11 If $\frac{3^{2x-8}}{225} = \frac{5^3}{5^x}$, then the value of x is

a) 1 b) 2 c) 5 d) 7

Q12 The value of $\frac{\log 8 - \log 2}{\log 32}$ is

a) $\frac{1}{5}$ b) $\frac{1}{4}$ c) $\frac{2}{5}$ d) $\frac{1}{3}$

Section – B

Q 13 Convert 59.36 into its binary form.

Q14 Given $\log 3 = 0.4771$, find the number of digits in 3^{62}

Q15 Prove that $x^{\log y - \log z} \cdot y^{\log z - \log x} \cdot z^{\log x - \log y} = 1$

Q16 Simplify : $\frac{5 \cdot 25^{n+1} - 25 \cdot 5^{2n}}{5 \cdot 5^{2n+3} - 25^{n+1}}$

Q17 Solve the following equations:

$$2^x + 3^y = 7 \quad \text{and} \quad 2^{x+2} - 3^{y-1} = 15$$

Q18 If $U = \{5, 6, 7, 8, 9, 10, 11, 12\}$, $A = \{7, 8, 9, 10\}$ and $B = \{5, 8, 9, 10, 11, 12\}$.

Verify that $(A \cap B)' = A' \cup B'$

Section – C

Q19 Find n, if $\frac{x^n + y^n}{x^{n-1} - y^{n-1}} = \sqrt{xy}$, $x \neq y$

Q20 In a survey of 25 students, it was found that 15 had taken Mathematics, 12 had taken Physics and 11 had taken Chemistry, 5 had taken Mathematics and Chemistry, 9 had taken Mathematics and Physics, 4 had taken Physics and Chemistry and 3 had taken all three subjects. Find:

- (i) How many students had taken Chemistry only?
- (ii) How many students had taken Physics and Chemistry but not Mathematics?
- (iii) How many students had taken only one of the subjects?

Applied Maths

Marking Scheme / Hints to Solution

May Unit Test

Note:- Any relevant solution not mentioned here but correct would be suitably awarded

<u>Q1</u>	b) -4		
<u>Q2</u>	a) $3^{1/3}$		
<u>Q3</u>	c) 27		
<u>Q4</u>	b) 5		
<u>Q5</u>	d) $1/3$		
<u>Q6</u>	d) {4, 12}		
<u>Q7</u>	2^7		
<u>Q8</u>	c) $\frac{19}{9}$		
<u>Q9</u>	e) 5		
<u>Q10</u>	c) 4		
<u>Q11</u>	c) $(11101)_2$		
<u>Q12</u>	d) $(100001)_2$		
<u>Q13</u>	$(A \cup B)' = \{5, 7, 8, 9, 10, 11, 12\}' = \{6\}$ $A' \cap B' = \{6\}$	1	2
<u>Q14</u>	Let $x = 2^{62}$ Take log on both sides $\log x = 62 \log 2$ $= 62 \times 0.3010$ $\log x = 18.6620$ Characteristic = 18 No. of digits = $C+1 = 18+1 = 19$ Ans	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2

015

$$\begin{aligned} \text{L.H.S. } xyz+1 &= \frac{\log a}{\log 2a} \times \frac{\log 2a}{\log 3a} \times \frac{\log 3a}{\log 4a} + 1 \\ &= \frac{\log a}{\log 4a} + 1 \\ &= \frac{\log a + \log 4a}{\log 4a} \\ &= \frac{\log 4a^2}{\log 4a} = \frac{\log (2a)^2}{\log 4a} \\ &= 2 \frac{\log 2a}{\log 4a} \end{aligned}$$

R.H.S. $2yz = 2 \times \frac{\log 2a}{\log 3a} \times \frac{\log 3a}{\log 4a}$

$$= \frac{2 \log 2a}{\log 4a}$$

L.H.S. = R.H.S.

016 Same as set A 016

018

2	125	R
2	62	1
2	31	0
2	15	1
2	7	1
2	3	1
2	1	1
	0	1

Decimal Part	Product	Binary
0.125×2	0.250	0
0.250×2	0.500	0
0.500×2	1.000	1

$$(125.125)_{10} = (1111101.001)_2$$

019

$$(a^n + b^n)(a + b) = 2ab(a^{n-1} + b^{n-1})$$

$$a^{n+1} + a^n b + b^n a + b^{n+1} = 2a^n b + 2a b^n$$

$$a^{n+1} - a^n b + b^{n+1} - b^n a = 0$$

$$a^n(a-b) + b^n(b-a) = 0$$

$$(a-b)(a^n - b^n) = 0$$

$$a-b=0$$

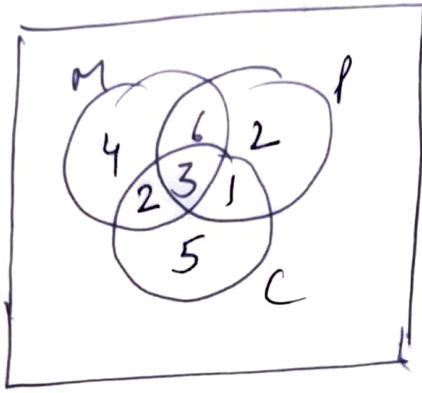
$$a=b$$

$$a^n - b^n = 0$$

$$a^n = b^n$$

$$\left(\frac{a}{b}\right)^n = 1 = \left(\frac{a}{b}\right)^0 \Rightarrow |n| = 0 \text{ Ans}$$

Q20



(i) $n(\text{only Physics}) = 2$

ii) $n(\text{Math and Chemistry but not Physics}) = 2$

iii) $n(\text{no. of students who study at least one of the three subjects})$
 $= 4 + 6 + 2 + 2 + 3 + 1 + 5 = 23$



May Test of Applied Maths

Class – XI (2024-25)

Set - B

Time : 1 hour

M.M. - 30

Instructions :

1. All questions are compulsory.
2. This question paper has 3 Sections. Section A has 12 questions of 1 mark each. Section B has 6 Questions of 2 marks each. Section C has 2 questions of 3 marks each.

Q1 The characteristics of the $\log 0.0008889$ is

- a) 4 b) -4 c) 5 d) -5

Q2 Among these numbers tell which one is greatest:

$$\frac{1}{3^3}, \quad \frac{1}{5^5}, \quad 2^{\frac{1}{3}}, \quad 3^{\frac{1}{5}}$$

- a) $3^{\frac{1}{3}}$ b) $5^{\frac{1}{5}}$ c) $2^{\frac{1}{3}}$ d) $3^{\frac{1}{5}}$

Q3 If $\log_x 3 = \frac{1}{3}$ then value of x is

- a) 4 b) 36 c) 27 d) 25

Q4 $(625)^{0.16} \times (625)^{0.09}$ is equal to

- a) 4 b) 5 c) 6 d) 625

Q5 The value of $\frac{\log 9 - \log 3}{\log 27}$ is

- a) $\frac{1}{5}$ b) $\frac{1}{4}$ c) $\frac{2}{5}$ d) $\frac{1}{3}$

Q6 If $A = \{4, 5, 8, 12\}$ and $B = \{5, 6, 7, 8, 9\}$ then $A - B$ is

- a) $\{5\}$ b) $\{6, 7, 9\}$ c) $\{5, 8\}$ d) $\{4, 12\}$

Q7 If $P = \{a, b, c, d, e, f, g\}$ and $Q = \{8, 1\}$ then number of subsets of set A are

- a) 12 b) 9 c) 2^{14} d) 2^{12}

Q8 The value of $27^{\frac{-2}{3}} + 16^{\frac{1}{4}}$ is

- a) $\frac{1}{50}$ b) $\frac{1}{18}$ c) $\frac{19}{9}$ d) $\frac{36}{50}$

Q9 If $\frac{3^{2x-8}}{225} = \frac{5^3}{5^x}$, then the value of x is

- a) 1 b) 2 c) 5 d) 7

Q10 The value of $\log_{3\sqrt{2}} 324$ is

- a) 8 b) 6 c) 4 d) 2

Q11 Among these four numbers : $(111)_2$, $(1101)_2$, $(11101)_2$, $(10010)_2$ which one is greatest.

- a) $(111)_2$ b) $(1101)_2$ c) $(11101)_2$ d) $(10010)_2$

Q12 Which of the following binary number is equivalent to decimal number 33?

- a) $(10010110)_2$ c) $(10001010)_2$
b) $(100000)_2$ d) $(100001)_2$

Section – B

Q13 If $U = \{5, 6, 7, 8, 9, 10, 11, 12\}$, $A = \{7, 8, 9, 10\}$ and $B = \{5, 8, 9, 10, 11, 12\}$.

Verify that $(A \cup B)' = A' \cap B'$

Q14 Given $\log 2 = 0.3010$, find the number of digits in 2^{62}

Q15 If $x = \log_{2a} a$, $y = \log_{3a} 2a$, $z = \log_{4a} 3a$

Then prove that $xyz + 1 = 2yz$

Q16 Simplify : $\frac{5 \cdot 25^{n+1} - 25 \cdot 5^{2n}}{5 \cdot 5^{2n+3} - 25^{n+1}}$

Q17 Solve the following equations:

$$3^x + 2^y = 7 \quad \text{and} \quad 3^{x+2} - 2^{y-1} = 15$$

Q 18 Convert 125.125 into its binary form.

Section – C

Q19 Find n , if $\frac{a^n + b^n}{a^{n-1} + b^{n-1}} = \frac{2ab}{a+b}$, $a \neq b$

Q20 In a survey of 25 students, it was found that 15 had taken Mathematics, 12 had taken Physics and 11 had taken Chemistry, 5 had taken Mathematics and Chemistry, 9 had taken Mathematics and Physics, 4 had taken Physics and Chemistry and 3 had taken all three subjects. Find:

- (i) How many students had taken Physics only?
- (ii) How many students had taken Mathematics and Chemistry but not Physics?
- (iii) How many students had taken atleast one of the subjects?

Applied Maths

Marking Scheme / Hints + Solution
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Note:- Any relevant solution not mentioned here but correct would be suitably awarded

Q1 a) $(10010110)_2$

Q2 d) 256

Q3 a) 4

Q4 b) {6, 7, 9}

Q5 c) 2^4

Q6 b) $1/18$

Q7 c) 4

Q8 c) $(11101)_2$

Q9 d) -5

Q10 d) $3^{1/5}$

Q11 c) 5

Q12 c) $2/5$

2	59	R
2	29	1
2	14	1
2	7	0
2	3	1
2	1	1
	0	1

Decimal part	Product	Binary
0.36×2	0.72	0
0.72×2	1.44	1
0.44×2	0.88	0
0.88×2	1.76	1
0.76×2	1.52	1
0.52×2	1.04	1

So, $(59.36)_{10} = (111011.010111)_2$

Let $x = 3^{62}$

Take log on both sides

$\log x = 62 \log 3$

$\log x = 62 \times 0.4771$

$\log x = 29.280$

$\frac{1}{2}$
 $\frac{1}{2}$
 $\frac{1}{2}$

So, Characteristic of $\log x = 29$

$$\begin{aligned}\text{No. of digits} &= C + 1 \\ &= 29 + 1 \\ &= 30 \text{ Ans}\end{aligned}$$

Q15

$$x \log y - \log 3 \cdot y \log 3 - \log x \cdot \log y = 1$$

Take log on both sides

$$(\log y - \log 3) \log x + (\log 3 - \log x) \log y + (\log x - \log y) \log 3 = \log 1$$

L.H.S.

$$\begin{aligned}\log y \log x - \log 3 \log x + \log 3 \log y - \log x \log y \\ + \log x \log 3 - \log y \log 3 \\ = 0\end{aligned}$$

R.H.S. $\log 1 = 0$

Q16

$$\frac{5 \cdot 25^{n+1} - 25 \cdot 5^{2n}}{5 \cdot 5^{2n+3} - 25^{n+1}}$$

$$= \frac{5 \times (5)^{2n+2} - 5^2 \times 5^{2n}}{5 \times 5^{2n+3} - 5^{2n+2}}$$

$$= \frac{5^{2n+3} - 5^{2n+2}}{5^{2n+4} - 5^{2n+2}}$$

$$= \frac{5^{2n+2} (5-1)}{5^{2n+2} (5^2-1)}$$

$$= \frac{4}{24}$$

$$= \frac{1}{6}$$

Q17

$$2^x + 3^y = 7$$

$$2^{x+2} - 3^{y-1} = 15$$

$$\text{Let } 2^x = a, \quad 3^y = b$$

$$a + b = 7$$

$$4a - \frac{b}{3} = 15$$

$$\Rightarrow 12a - b = 45$$

On solving

$$b = 3 \text{ and } a = 4$$

Ans

So, $2^x = 4$ and $3^y = 3$
 $\Rightarrow \boxed{x=2, y=1}$ Ans

$(A \cap B)^c = \{8, 9, 10\}^c = \{5, 6, 7, 11, 12\}$

$A^c \cup B^c = \{5, 6, 7, 11, 12\}$

$x^n + y^n = (xy)^{\frac{1}{2}} (x^{n-1} + y^{n-1})$

$x^n + y^n = x^{n-\frac{1}{2}} y^{\frac{1}{2}} + x^{\frac{1}{2}} y^{n-\frac{1}{2}}$

$\Rightarrow x^{n-\frac{1}{2}} (x^{\frac{1}{2}} - y^{\frac{1}{2}}) + y^{n-\frac{1}{2}} (y^{\frac{1}{2}} - x^{\frac{1}{2}}) = 0$

$\Rightarrow x^{\frac{1}{2}} - y^{\frac{1}{2}} = 0$ or $x^{n-\frac{1}{2}} - y^{n-\frac{1}{2}} = 0$

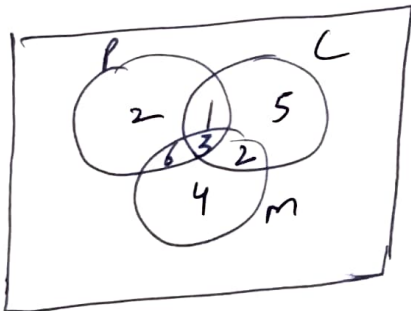
$\Rightarrow x = y$
 which is
 not possible
 (given)

$x^{n-\frac{1}{2}} = y^{n-\frac{1}{2}}$

$\left(\frac{x}{y}\right)^{n-\frac{1}{2}} = 1 = \left(\frac{x}{y}\right)^0$

$\Rightarrow n - \frac{1}{2} = 0$

$\Rightarrow \boxed{n = \frac{1}{2}}$



(i) $n(\text{only } C) = 5$

(ii) $n(\text{Physics and Chem. but not Maths}) = 8$

(iii) $n(\text{only one subject}) = 2 + 4 + 5 = 11$