Time : 1 hr 30 min   **M.M. 40**
Instructions :

All questions are compulsory. This question paper has 5 Sections. Section A has 10 questions of 1 mark each. Section B has 7 Questions of 2 marks each. Section C has 2 questions of 3 marks each. Section D has 2 questions of 5 mark each.

Section – A

Q1 Which of the following binary number is equal to decimal number 47?

   a) $(101110)_2$ b) $(101111)_2$ c) $(100111)_2$ d) $(101010)_2$

Q2 If 8^{x+1} = 64, then the value of 3^{2x+1} is

   a) 27   b) 3   c) 9   d) 15

Q3 The value of $\log_{\sqrt{2}} 32$ is

   a) 8   b) 6   c) 10   d) 9

Q4 If a = b^x , b = c^y and c = a^z then the value of xyz is

   a) 0   b) -1   c) 1   d) 3

Q5 Which of the following is not true

   a) A ∩ B = B ∩ A   b) A ∩ A = A   c) A ∩ ∅ = ∅   d) A ∩ U = U

Q6 Let A = {1, 2, 3} and B = {7, 8} then number of relations from set A to set B are

   a) 6   b) 2^6 c) 5   d) 2^5

Q7 The sum of 99 terms of the series 1 – 1 + 1 – 1 + 1 – 1 + 1 .... is

   a) 1   b) -1   c) 0   d) 2

Q8 The two arithmetic mean's between - 2 and 4 are

   a) -1, 3   b) 0, 2   c) -1, 1   d) 0, 3

Q9 If the characteristics of 0.012345 and 0.0001234 are taken as p and q then the value of

   p – q is

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

Q10 If A = {a, b, c, d, e} and B = {d, e, f, g} then (A – B) ∩ (B – A) is

   a) {d, e}   b) ∅   c) {a, b, c}   d) {f, g}

Section B

Q11 Find the sum of series 2 + 5 + 8 + _..................... + 182

Q12 If A = {1, 4} , B = {2, 3, 6} and C = {2, 3, 7} then find (A x B) ∪ (A x C)

Q13 In a class of 25 students, 12 students have taken Economics, 8 have taken Economics but not Maths. Find the number of students who have taken Economics and Maths.

Q14 Find x, if log x = log 3 + 2 log 2 $-\frac{3}{4}$ log 16

Q15 Simplify $\frac{11^{n+1} - 11^{n-1}}{11^{n-1} - 11^{n-2}}$

Q16 Convert $(101.1101)_2$ into its decimal form.

Q17 Prove that $\log \frac{75}{16} - 2 \log \frac{5}{9} + \log \frac{32}{243}$ = log 2

Section – C

Q18 Let A = {1, 2, 3, 4, ... , 14} and a relation R is defined from A to A by

R = { (x, y): 3x – y = 0; x, y ∈ A}.

i)   Write R in its roster form.
ii)   Write its domain, range and co-domain.

Q19 If U = {1, 2, 3, 4, 5, 6, 7, 8}, A = {1, 2, 3, 4} and B = {3, 4, 6} then verify that

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

Section – D

Q20 Find the seventh root of 0.00001427

Q21 The sum of n terms of two A.P.'s are in the ratio (5n + 4) : (9n + 6). Find the ratio of their 18th terms.

Applied Maths

Class – XI

Marking Scheme / Hints to Solution

Note :– Any other relevant answer not given here in but done by students will be suitably awarded.

Q. No	Value Points / Key Points	Value Point	Total Point
1	b) $(101111)_2$		1
2	a) 27		1
3	c) 10		1
4	c) 1		1
5	d) $A \cap U = U$		1
6	b) 2^6		1
7	a) 1		1
8	b) 0,2		1
9	d) 2		1
10	b) ϕ		1

11

$2 + 5 + 8 + \text{---} \text{---} + 182$

$a_2 - a_1 = 5 - 2 = 3 = d$

$a = 2, \quad d = 3$

$a_n = 182$

$a + (n-1)d = 182$

$2 + (n-1)3 = 182$

$3(n-1) = 180$

$n - 1 = 60$

$\boxed{n = 61}$

$S_n = \frac{n}{2}[2a + (n-1)d]$

$= \frac{61}{2}[4 + 60 \times 3]$

$= \frac{61}{2} \times [4 + 180]$

$= \frac{61}{2} \times 184$

$= 61 \times 92$

$= 5612$

(Value Point 1, Total Point 2)

12

$A = \{1, 4\}, \quad B = \{2, 3, 6\}, \quad C = \{2, 3, 7\}$

$A \times B = \{(1,2), (1,3), (1,6), (4,2), (4,3), (4,6)\}$ $\frac{1}{2}$

$A \times C = \{(1,2), (1,3), (1,7), (4,2), (4,3), (4,7)\}$ $\frac{1}{2}$

$(A \times B) \cup (A \times C) = \{(1,2), (1,3), (1,6), (1,7), (4,2), (4,3), (4,6), (4,7)\}$ (Value Point 1, Total Point 2)

13

$n(E_{co}) = 12$

$n(E_{co} \cap M') = 8$

$n(E \cap M) = n(E) - n(E \cap M')$

$= 12 - 8 = 4$ Ans

Eco Maths

8

		2
1		
1		

14

$\log x = \log 3 + 2 \log 2 - \frac{3}{4} \log 16$

$= \log 3 + \log 2^2 - \log (16)^{3/4}$

$= \log 3 + \log 4 - \log (2)^3$

$= \log 3 \times 4 - \log 8$

$\log x = \log \left(\frac{12}{8}\right)$

$\boxed{x = \frac{3}{2}}$ Ans

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

15

$\dfrac{11^{n+1} - 11^{n-1}}{11^{n-1} - 11^{n-2}} = \dfrac{11^{n-1}\left(11^2 - 1\right)}{11^{n-2}\left(11 - 1\right)}$

$= 11^{n-1-n+2}\dfrac{\left[121 - 1\right]}{10}$

$= 11\dfrac{\left[12\not{0}\right]}{1\not{0}}$

$= 132$

| 1 | | |
| 4 | | 2 |

16

$(101 \cdot 1101)_2$

$= 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 1 \times 2^{-2} +$

$\qquad 0 \times 2^{-3} + 1 \times 2^{-4}$

$= 4 + 0 + 1 + \frac{1}{2} + \frac{1}{4} + 0 + \frac{1}{16}$

$= 5 + \dfrac{8 + 4 + 1}{16}$

$= 5 + \dfrac{13}{16}$

$= 5 + 0.8125$

$= 5.8125$

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

17 L.H.S

$\log \frac{75}{16} - 2 \log \frac{5}{9} + \log \frac{32}{243}$

$= \log 75 - \log 16 - 2(\log 5 - \log 9) + \log 32 - \log 243$

$= \log 5^2 \times 3 - \log 2^4 - 2\log 5 + 2\log 9 + \log 2^5 - \log 3^5$

$= 2\log 5 + \log 3 - 4\log 2 - 2\log 5 + 2\log 3^2 + 5\log 2 - 5\log 3$

$= \log 5(2-2) + \log 2(-4+5) + \log 3(1+4-5)$

$= 0 + \log 2 + 0$

$= \log 2 = $ R.H.S.

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$ 2

18

$A = \{1, 2, 3, 4, \text{------} 14\}$

$R = \{(x,y); \ 3x-y=0, \ x,y \in A\}$

(i) $R = \{(1,3), (2,6), (3,9), (4,12)\}$

$1\frac{1}{2}$

(ii) Domain of $R = \{1, 2, 3, 4\}$

Range of $R = \{3, 6, 9, 12\}$

Codomain of $R = \{1, 2, 3, 4, \text{------} 14\}$

$1\frac{1}{2}$ 3

19 $U = \{1, 2, 3, \text{------} 8\}$, $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 6\}$

L.H.S $(A \cap B)' = \{3, 4\}'$

$= \{1, 2, 5, 6, 7, 8\}$

$1\frac{1}{2}$

R.H.S $A' \cup B' = \{5, 6, 7, 8\} \cup \{1, 2, 5, 7, 8\}$

$= \{1, 2, 5, 6, 7, 8\}$

So, $(A \cap B)' = A' \cup B'$

$1\frac{1}{2}$ 3

20 Let $x = (0.0000 1427)^{1/7}$

So, $\log n = \frac{1}{7} \log (0.0000 1427)$

$= \frac{1}{7} \times (\overline{5}. 1545)$

$= \frac{1}{7} (-5 + 0.1545)$

$= \frac{1}{7}(-5-2+2 +0.1545)$

$= \frac{-7}{7} + \frac{2.1545}{7}$

$$\log x = -1 + 0.3078$$
$$\log x = \bar{1}.3078$$
$$x = \text{Antilog } (\bar{1}.3078)$$
$$\boxed{x = 0.2032} \quad \text{Ans}$$

42)

Let first term and common difference of first A.P.
are $= a_1, d_1$

Let first term and common difference of second A.P. $= a_0, d_0$

So,
$$\frac{S_n}{S_n'} = \frac{\frac{n}{2}[2a_1 + (n-1)d_1]}{\frac{n}{2}[2a_0 + (n-1)d_0]} = \frac{5n+4}{9n+6}$$

$$\Rightarrow \frac{2a_1 + (n-1)d_1}{2a_0 + (n-1)d_0} = \frac{5n+4}{9n+6}$$

To find $\quad \dfrac{a_{18}}{a_{18}'} = \dfrac{a_1 + 17d_1}{a_0 + 17d_0} = ?$

Now $\quad \dfrac{2a_1 + (n-1)d_1}{2a_0 + (n-1)d_0} = \dfrac{5n+4}{9n+6}$

$$\frac{2[a_1 + \frac{n-1}{2}d_1]}{2[a_0 + \frac{n-1}{2}d_0]} = \frac{5n+4}{9n+6} \quad —①$$

Take $\dfrac{n-1}{2} = 17$

$$\Rightarrow \boxed{n = 35}$$

Put $n = 35$ in ①

$$\frac{a_1 + \frac{35-1}{2}d_1}{a_0 + \frac{35-1}{2}d_0} = \frac{5 \times 35 + 4}{9 \times 35 + 6}$$

$$\Rightarrow \frac{a_1 + 17d_1}{a_0 + 17d_0} = \frac{179}{321} \quad \text{Ans}$$