Q.1 In an examination, 41% candidate failed in Music and 32% failed in Mathematics. Also, 13% failed in both the subjects. If the number of candidates who passed in Music alone is 399, then the total number of candidates is-

(A) 2100 (B) 2000
(C) 2400 (D) 5200

Q.2 The set $(A \cup B \cup C) \cap (A \cap B^C \cap C^C)^C \cap C^C$ is equal to-

(A) $B \cup C^C$ (B) $A \cap C$
(C) $B \cap C^C$ (D) None of these

Q.3 Two finite sets have m and n elements respectively. The total number of subsets of first set is 56 more than the total number of subsets of the second set. The values of m and n respectively are-

(A) 7, 6 (B) 6, 3
(C) 5, 1 (D) 8, 7

Q.4 For $x, y \in R$, define a relation R by x R y if and only if $x - y + \sqrt{2}$ is an irrational number. Then R is-

(A) An equivalence relation
(B) R is symmetric
(C) R is transitive
(D) None of these

Q.5 Let a relation R_1 on the set R of real numbers be defined as $(a, b) \in R_1 \Leftrightarrow 1 + ab > 0$ for all $a, b \in R_1$ then R_1 is-

(A) Reflexive, symmetric
(B) An equivalence relation
(C) Symmetric, transitive
(D) Reflexive, transitive

Q.6 Let R be a relation on the set N of natural numbers defined by nRm $\Leftrightarrow$ n is a factor of m (i.e., n|m). then R is-

(A) Reflexive and symmetric
(B) Transitive and symmetric
(C) Equivalence
(D) Reflexive, transitive but not symmetric

Q.7 Lets be any non empty set & P(s) be its powerset. We define a relation R on P(S) by ARB to mean $A \subseteq B$, then R is-

(A) Reflexive, transitive
(B) Reflexive but not transitive
(C) Reflexive, symmetric
(D) Symmetric, transitive

Q.8 Let R and S be two non-void relatiosn on a set A. Which of the following statement is false-

(A) R and S are transitive $\Rightarrow R \cup S$ is transitive
(B) R and S are transitive $\Rightarrow R \cap S$ is transitive
(C) R and S are symmetric $\Rightarrow R \cup S$ is symmetric
(D) R and S are reflexitve $\Rightarrow R \cap S$ is reflexive.

Q.9 The number of elements in the set $\{(a, b) : 2a^2 + 3b^2 = 35, a, b \in Z\}$, where Z is the set of all integers, is-

(A) 2 (B) 4
(C) 8 (D) 12

MATHEMATICS IIT JEE (CLASS TEST - 1) (SETS) ANSWER KEY

Name : .... Roll No. : ....

	A	B	C	D		A	B	C	D		A	B	C	D
1	○	○	○	○	4	○	○	○	○	7	○	○	○	○
2	○	○	○	○	5	○	○	○	○	8	○	○	○	○
3	○	○	○	○	6	○	○	○	○	9	○	○	○	○

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9
Ans.	A	C	B	D	A	D	A	A	C

SOLUTION

Sol.1 (A)

Number of candidates passed in music alone

= Number of candidates failed in Maths alone

= Number of candidates failed in Maths

– Number of candidates failed in both subjects

= (32 – 13) = 19%

But the number of candidates who passed in Music alone is 399.

$\therefore$ Total number of candidates

$$= \frac{399}{19} \times 100 = 21 \times 100 = 2100$$

Sol.2 (C)

$(A \cup B \cup C) \cap (A \cap B^C \cap C^C) \cap C^C$

$= (A \cup B \cup C) \cap (A^C \cup B \cup C) \cap C^C$

$= [(A \cap A^C) \cup (B \cup C)] \cap C^C$

$= (B \cup C) \cap C^C$

$= (B \cap C^C) \cup (C \cap C^C)$

$= B \cap C^C$.

Sol.3 (B)

According to the given condition, we have

$2^m = 2^n + 56$

$\Rightarrow \quad 2^{m-3} - 2^{n-3} = 7$

$\Rightarrow \quad 2^{n-3}(2^{m-n} - 1) = 7$.

Since 7 is a prime number so we must have $n - 3 = 0$ (clearly $m \neq n$). Thus $n = 3$.

Therefore, $2^m = 2^3 + 56 = 64 = 2^6$

$\Rightarrow \quad m = 6$.

Sol.4 (D)

Since $x - x + \sqrt{2} = \sqrt{2}$ which is an irrational number so x R x for all $x \in R$. Hence R is reflexive. R is not symmetric as $(\sqrt{2}, 1) \in R$ but $(1, \sqrt{2}) \notin R$. Again R is not transitive since $(\sqrt{2}, 1) \in R$ and $(1, 2\sqrt{2}) \in R$ but $(\sqrt{2}, 2\sqrt{2}) \notin R$.

Sol.5 (A)

Reflexive $a \in R$

$1 + a.a = 1 + a^2 > 0$

$\Rightarrow \quad (a, a) \in R_1 \qquad R_1$ is reflexive

Symmetric $(a, b) \in R_1$

$1 + ab > 0$

$\Rightarrow \quad 1 + ba > 0$

$\because \quad ab = ba$ for all $a, b \in R$

$\Rightarrow \quad (b, a) \in R_1$

$\Rightarrow \quad R_1$ is symmetric on R

Transitive,

We observe that $\left(1, \frac{1}{2}\right) \in R_1$ & $\left(\frac{1}{2}, -1\right) \in R_1$ but $(1, -1) \notin R_1$

as $1 + (1)(-1) = 0 \not> 0$

$\Rightarrow \quad R_1$ is not transitive on R

Sol.6 (D)

Since n|n for all $n \in N$, therefore R is reflexive. Since 2|6 but 6∤2, therefore R is not symmetric.

Let n R m and m R p

$\Rightarrow$ n|m and m|p $\Rightarrow$ n|p $\Rightarrow$ nRp.

So, R is transitive.

Sol.7 (B)

Reflexive :

$A \in P(S)$

$\Rightarrow \quad A \subseteq A \qquad \Rightarrow \quad$ ARA

$\therefore \quad$ R is reflexive

Symmetric :

Let $A = \phi$ & B be any non empty subset of S, then $A \subseteq B$ but B is not subset of A

$\Rightarrow$ (A, B) $\in$ R but (B, A) $\notin$ R

$\Rightarrow$ R is not symmetric

Transitive :

ARB and BRC

$\Rightarrow$ $A \subseteq B$ and $B \subseteq C$

$\Rightarrow$ $A \subseteq C$

$\Rightarrow$ ARC

$\Rightarrow$ R is transitive.

Sol.8 (A)

Let A = {1, 2, 3} and R = {(1, 1), (1, 2)}, S = {(2, 2), (2, 3)} be transitive relation on A.

Then $R \cup S$ = {(1, 1); (1, 2); (2, 2); (2, 3)}

Obviously, $R \cup S$ is not transitive.

Since (1, 2) $\in R \cup S$ and (2, 3) $\in R \cup S$ but (1, 3) $\notin R \cup S$.

Sol.9 (C)

Given set is

$\{(a, b) : 2a^2 + 3b^2 = 35, a, b \in Z\}$

We can see that $2(\pm 2)^2 + 3(\pm 3)^2 = 35$

and $2(\pm 4)^2 + 3(\pm 1)^2 = 35$

$\therefore$ (2, 3), (2, –3), (–2, –3), (–2, 3), (4, 1), (4, –1), (–4, –1), (–4, 1) are 8 elements of the set.

$\therefore$ n = 8.