Assignment 2

EE24Btech11024 - G. Abhimanyu Koushik

1) If the mean deviation of the numbers $1, 1+d, 1+2d, \ldots, 1+100d$ from their mean is 255, then d is equal to:

(2009)

a) 20 b) 10.1 c) 20.2 d) 10

2) Let S be a non-empty subset of $\mathbb{R}$. Consider the following statement:
P: There is a rational number $x \in S$ such that $x > 0$.
Which of the following is the negation of statement P?

(2010)

a) There is no rational number $x \in S$ such that $x \leq 0$.
b) Every rational number $x \in S$ satisfies $x \leq 0$.
c) $x \in S$ and $x \leq 0 \longrightarrow x$ is not rational.
d) There is a rational number $x \in S$ such that $x \leq 0$.

3) Consider the following relations:

$R = \{(x, y) \mid x, y$ are real numbers and $x = wq$ for some rational number $w\}$;

$S = \left\{\left(\frac{m}{n}, \frac{p}{q}\right) \mid m, n, p, q$ are integers such that $n \neq 0, q \neq 0$ and $qm = pn\right\}$

(2010)

a) Neither R nor S is an equivalence relation.
b) S is an equivalence relation but R is not.
c) R and S both are equivalence relations.
d) R is an equivalence relation but S is not.

4) For two data sets, each of size 5, the variances are given to be 4 and 5 and the corresponding means are given to be 2 and 4, respectively. The variance of the combined data set is

(2010)

a) $\frac{11}{2}$ b) 6 c) $\frac{13}{2}$ d) $\frac{5}{2}$

5) Let $\mathbb{R}$ be a set of real numbers.

Statement-1:$A = \{(x, y) \in \mathbb{R} \times \mathbb{R} \mid y - x$ is an integer$\}$ is an equivalence relation on $\mathbb{R}$

Statement-2: $B = \{(x, y) \in \mathbb{R} \times \mathbb{R} \mid x = \alpha y$ for some ration is an equivalence relation oj $\mathbb{R}$

(2011)

a) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation of Statement-1
b) Statement-1 is true, Statement-2 is false.
c) Statement-1 is false, Statement-2 is true.
d) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation of Statement-1

6) Consider
P: Suman is brilliant
Q: Suman is rich
R: Suman is honest
The negation of the statement "Suman is brilliant and dishonest if and only if Suman is rich" can be expressed as

(2011)

a) $\sim (Q \leftrightarrow (P \wedge \sim R))$
b) $Q \leftrightarrow \sim P \wedge R$
c) $\sim (P \wedge \sim R) \leftrightarrow \sim Q$
d) $\sim P \wedge (Q \leftrightarrow \sim R)$

7) If the mean deviation about the median of the numbers $a, 2a, \ldots, 50a$ is 50, then $|a|$ equals:

(2011)

a) 3 b) 4 c) 5 d) 2

8) The negation of the statement
"If I become a teacher, then I will open a school" is:

(2012)

a) I will become a teacher and I will not open a school
b) Either I will not become a teacher or I will not open a school
c) Neither will I become a teacher nor will I open a school
d) I will not become a teacher or I will open a school

9) Let $x_1, x_2, \ldots, x_n$ be n observations, and let $\overline{x}$ be their arithmetic mean and σ^2 be the variance.
Statement-1: Variance of $2x_1, 2x_2, \ldots, 2x_n$ is $4\sigma^2$.
Statement-2: Arithmetic mean of $2x_1, 2x_2, \ldots, 2x_n$ is $2\overline{x}$.
(2012)
a) Statement-1 is false, Statement-2 is true.
b) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation of Statement-1
c) Statement-1 is true, Statement-2 is true; Statement-2 is **not** a correct explanation of Statement-1
d) Statement-1 is true, Statement-2 is false.

10) Let $X = \{1, 2, 3, 4, 5\}$. The number of different ordered pairs (Y, Z) that can be formed such that $Y \subseteq X$, $Z \subseteq X$, $Y \cap Z$ is empty is:
(2012)
a) 5^2 b) 3^5 c) 2^5 d) 5^3

11) Let A and B be 2 sets containing 2 elements and 4 elements respectively. The number of subsets of $A \times B$ having 3 or more elements is
($JEEM$2013)
a) 256 b) 220 c) 219 d) 211

12) Consider
Statement-1: $(p \wedge \sim q) \wedge (\sim p \wedge q)$ is a fallacy.
Statement-2: $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a tautology.
($JEEM$2013)
a) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation of Statement-1
b) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation of Statement-1
c) Statement-1 is true, Statement-2 is false.
d) Statement-1 is false, Statement-2 is true.

13) All the students of a class performed poorly in Mathematics. The teacher decided to give grace marks of 10 to each of the students. Which of the following statistical measures will not change even after the grace marks were given?
($JEEM$2013)
a) mean c) mode
b) median d) variance

14) If $X = \{4^n - 3n - 1 : n \in \mathbb{N}\}$ and $Y = \{9(n-1) : n \in \mathbb{N}\}$, where $\mathbb{N}$ is the set of natural numbers, then $X \cup Y$ is equal to:
($JEEM$2014)
a) X b) Y c) $\mathbb{N}$ d) $Y - X$

15) The variance of the first 50 natural numbers is
($JEEM$2014)
a) 437 b) $\frac{437}{4}$ c) $\frac{833}{4}$ d) 833