Assignment 2
2022-June
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EE24BTECH11049
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1 MCQ

1) Five numbers x_1, x_2, x_3, x_4, x_5 are randomly selected from the numbers $1, 2, 3, \ldots, 18$ and are arranged in the increasing order ($x_1 < x_2 < x_3 < x_4 < x_5$). The probability that $x_2 = 7$ and $x_4 = 11$ is:

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a) $\frac{1}{136}$ b) $\frac{1}{72}$ c) $\frac{1}{68}$ d) $\frac{1}{34}$

2) Let X be a random variable having binomial distribution $\mathbf{B}(7, p)$. If $\mathbf{P}(X = 3) = 5\mathbf{P}(X = 4)$, then the sum of the mean and the variance of X is:

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a) $\frac{105}{16}$ b) $\frac{7}{16}$ c) $\frac{77}{36}$ d) $\frac{49}{16}$

3) The value of

$$\cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{6\pi}{7}\right)$$

is equal to;

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

4)

$$\sin^{-1}\left(\sin\frac{2\pi}{3}\right) + \cos^{-1}\left(\cos\frac{7\pi}{6}\right) + \tan^{-1}\left(\tan\frac{3\pi}{4}\right)$$

is equal to;

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a) $\frac{11\pi}{12}$ b) $\frac{17\pi}{12}$ c) $\frac{31\pi}{12}$ d) $-\frac{3\pi}{4}$

5) The boolean expression $(\sim (p \wedge q)) \vee q$ is equivalent to:

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a) $q \rightarrow (p \wedge q)$
b) $p \rightarrow q$
c) $p \rightarrow (p \rightarrow q)$
d) $p \rightarrow (p \vee q)$

2 INTEGER

1) let $f : \mathbf{R} \mapsto \mathbf{R}$ be a function defined by

$$f(x) = \frac{2e^{2x}}{e^{2x} + e^{x}}$$

then $f\left(\frac{1}{100}\right) + f\left(\frac{2}{100}\right) + f\left(\frac{3}{100}\right) + \cdots + f\left(\frac{99}{100}\right)$ is equal to _____

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2) If the sum of all the roots of the equation

$$e^{2x} - 11e^{x} - 45e^{-x} + \frac{81}{2} = 0$$

is $\log_e p$, then p is equal to _____

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3) The positive value of the determinant of the matrix A, whose

$$\text{adj}\,(\text{adj}\,(A)) = \begin{pmatrix} 14 & 28 & -14 \\ -14 & 14 & 28 \\ 28 & -14 & 14 \end{pmatrix},$$

is _____

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4) The number of ways, 16 identical cubes, of which 11 are blue and rest are red, can be placed in a row so that between any two red cubes there should be at least 2 blue cubes, is _____

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5) If the coefficient of x^{10} in the binomial expansion of

$$\left(\frac{\sqrt{x}}{5^{\frac{1}{4}}} + \frac{\sqrt{5}}{x^{\frac{1}{3}}}\right)^{60}$$

is $5^k l$ where $l, k \in \mathbf{N}$ and l is co-prime to 5, then k is equal to _____

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6)

$$A_1 = \left\{(x, y) : |x| \leq y^2, |x| + 2y \leq 8\right\} \text{ and } A_2 = \{(x, y) : |x| + |y| \leq k\}.$$

if $27\text{Area}\,(A_1) = 5\text{Area}\,(A_2)$, then k is equal to: _____

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7) If the sum of the first ten terms of the series

$$\frac{1}{5}+\frac{2}{65}+\frac{3}{325}+\frac{4}{1025}+\frac{5}{2501}+\ldots \text{ is } \frac{m}{n},$$

where m and n are co-prime numbers, then $m+n$ is equal to _____

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8) A rectangle R with end points of one of its sides as $(1,2)$ and $(3,6)$ s inscribed in a circle. If the equation of a diameter of the circle is $2x-y+4=0$, then the area of R is _____

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9) A circle of radius 2 unit passes through the vertex and the focus of the parabola $y^2=2x$ and touches the parabola $y=\left(x-\frac{1}{4}\right)^2+\alpha$ where $\alpha>0$. Then $(4\alpha-8)^2$ is equal to _____

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10) Let the mirror image of the point (a,b,c) with respect to the plane $3x-4y+12z+19=0$ be $(\alpha-6,\beta,\gamma)$. if $a+b+c=5$, then $7\beta-9\gamma$ is equal to _____

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