

6-04-2024 Shift-1

EE24BTECH11004 - ANKIT JAINAR

- 1) $I = \int_0^{\frac{\pi}{4}} \frac{\cos^2 x \sin^2 x}{(\cos^3 x + \sin^3 x)^2} dx$
 - a) $\frac{1}{6}$
 - b) $\frac{1}{3}$
 - c) $\frac{1}{2}$
 - d) 1
- 2) Find the range of x for which $f(x) = x^x (x > 0)$ is strictly increasing.
 - a) $(0, \infty)$
 - b) $\left(0, \frac{1}{e}\right]$
 - c) $\left[\frac{1}{e^2}, \infty\right)$
 - d) $\left[\frac{1}{e}, \infty\right)$
- 3) Let $A = \{100, 101, 102, \dots, 700\}$. Find the number of numbers in set A which are neither divisible by 3 nor by 4.
- 4) Given that $\frac{dy}{dx} + 2x \ln x \cdot y = 3 \ln x$, and $y(1) = 0$, find y .
- 5) Let $A_r = \begin{vmatrix} r & 1 & \frac{n^2}{2} + \alpha \\ 2r & 2 & n^2 - \beta \\ 3r - 2 & 3 & n(n-1) \end{vmatrix}$ Find $2A_{10} - A_8$.
 - a) $4\alpha + 2\beta$
 - b) $2n$
 - c) 0
 - d) $2\alpha + 4\beta$
- 6) If mean of 20 observation is 10, $SD = 2$. One of the observation which is 12 is replaced by 8. Find the value of new SD ?
 - a) $\sqrt{3.96}$
 - b) 1.8
 - c) $\sqrt{3.8}$
 - d) 1.93
- 7) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \frac{x^2 - 2x - 15}{x^2 - 4x + 9}$, then f is:
 - a) one-one onto
 - b) many-one onto
 - c) many-one into
 - d) one-one into
- 8) A company has two branches A and B . Branch A produces 60% of the total production and the remaining by branch B . Branch A produces 80% good quality products, and branch B produces 90% good quality products. A product is randomly selected, and it is found to be of good quality. Let P be the probability that the selected product is from branch B . Find the value of $126P$.
 - a) 54
 - b) 52
 - c) 48
 - d) 27
- 9) Find the shortest distance between two lines: $\frac{x-3}{2} = \frac{y+15}{-7} = \frac{z-9}{5}$ and $\frac{x+1}{2} = \frac{y-1}{1} = \frac{z-9}{-3}$.

- a) $4\sqrt{3}$
 b) $8\sqrt{3}$
 c) $6\sqrt{3}$
 d) $2\sqrt{3}$
- 10) If in the expansion of $(x+y)^n$, the terms are: $T_2 = 15$, $T_3 = 10$, $T_4 = \frac{10}{3}$ For $n = 5$, find the value of $n^3 + x^5 + 243y^5$.
 a) $\frac{e^2+1}{e}$
 b) $\frac{e^2-1}{e}$
 c) $\frac{e^2+2}{e}$
 d) $\frac{e^2-2}{e}$
- 11) Let $S = \{1, 2, 3, \dots, 20\}$ be a given set. Relation R_1 is defined as $R_1 = \{(x, y) : 2x - 3y = 2\}$ and R_2 as $R_2 = \{(x, y) : 4x = 5y\}$, where $x, y \in S$. If m denotes the number of elements required to make R_1 symmetric, and n denotes the number of elements to make R_2 symmetric, find $m + n$.
 a) 10
 b) 12
 c) 8
 d) 20
- 12) An equilateral triangle of side 12. A circle is embedded inside the triangle, and a square is embedded inside the circle. If the area and perimeter of the square are m and n , respectively, then find $m + n^2$.
- 13) In an octagon how many triangles are possible so that no side of triangle is side of octagon?
- 14) A variable line is passing through $(4, -9)$, slope of line is positive and it make intercepts on x and y-axis on point A and B. Find the minimum area of triangle OAB.
- 15) Solve: $(1 + x^2) \frac{dy}{dx} + y = e^{\tan^{-1} x}$, $y(1) = 0$. Then $y(0) =$