08-27-2021-shift-2(1-15)

EE24BTECH11055 - Sai Akhila Reddy Turpu

1) The angle between the straight lines, whose direction cosines are given by the equations $2\mathbf{l}+2\mathbf{m}-\mathbf{n}=0$ and $\mathbf{mn}+\mathbf{nl}+\mathbf{lm}=0$, is :

   a) $\frac{\pi}{2}$
   b) $\pi-\cos^{-1}\left(\frac{4}{9}\right)$
   c) $\cos^{-1}\left(\frac{8}{9}\right)$
   d) $\frac{\pi}{3}$

2) Let $A=\begin{pmatrix}[x+1] & [x+2] & [x+3]\\ [x] & [x+3] & [x+3]\\ [x] & [x+2] & [x+4]\end{pmatrix}$ where $[t]$ denotes the greatest integer less than or equal to t. If $det(A)=192$, then the set of values of x is the interval:

   a) $[68,69)$
   b) $[62,63)$
   c) $[65,66)$
   d) $[60,61)$

3) Let M and m respectively be the maximum and minimum values of the function $f(x)=\tan^{-1}(\sin x+\cos x)$ in $\left[0,\frac{\pi}{2}\right]$, then the value of $\tan(M-m)$ is equal to:

   a) $2+\sqrt{3}$
   b) $2-\sqrt{3}$
   c) $3+2\sqrt{2}$
   d) $3-2\sqrt{2}$

4) Each of the persons A and B independently tosses three fair coins. The probability that both of them get the same number of heads is:

   a) $\frac{1}{8}$
   b) $\frac{5}{8}$
   c) $\frac{5}{16}$
   d) 1

5) A differential equation representing the family of parabolas with axis parallel to y-axis and whose length of latus rectum is the distance of the point $(2,-3)$ from the line $3x+4y=5$, is given by:

   a) $10\frac{d^2y}{dx^2}=11$
   b) $11\frac{d^2x}{dy^2}=10$
   c) $10\frac{d^2x}{dy^2}=11$
   d) $11\frac{d^2y}{dx^2}=10$

6) If two tangents drawn from a point $\mathbf{P}$ to the parabola $y^2=16(x-3)$ are at right angles, then the locus of point $\mathbf{P}$ is:

   a) $x+3=0$
   b) $x+1=0$
   c) $x+2=0$
   d) $x+4=0$

7) The equation of the plane passing through the line of intersection of planes $\mathbf{r}\cdot\left(\hat{i}+\hat{j}+\hat{k}\right)=1$ and $\mathbf{r}\cdot\left(2\hat{i}+3\hat{j}-\hat{k}\right)+4=0$ and parallel to the x-axis is:

a) $\mathbf{r} \cdot \left(\hat{j} - 3\hat{k}\right) + 6 = 0$
b) $\mathbf{r} \cdot \left(\hat{i} + 3\hat{k}\right) + 6 = 0$
c) $\mathbf{r} \cdot \left(\hat{i} - 3\hat{k}\right) + 6 = 0$
d) $\mathbf{r} \cdot \left(\hat{j} - 3\hat{k}\right) - 6 = 0$

8) If the solution curve of the differential equation $\left(2x - 10y^3\right) dy + ydx = 0$, passes through the points $(0, 1)$ and $(2, \beta)$, then β is a root of the equation:

a) $y^5 - 2y - 2 = 0$
b) $2y^5 - 2y - 1 = 0$
c) $2y^5 - y^2 - 2 = 0$
d) $y^5 - y^2 - 1 = 0$

9) Let $\mathbf{A}(a, 0)$, $\mathbf{B}(b, 2b + 1)$ and $\mathbf{C}(0, b)$, $b \neq 0, |b| \neq 1$, be points such that the area of the triangle **ABC** is 1 sq. unit, then the sum of all possible values of a is:

a) $\frac{-2b}{b+1}$
b) $\frac{2b}{b+1}$
c) $\frac{2b^2}{b+1}$
d) $\frac{-2b^2}{b+1}$

10) Let $[\lambda]$ be the greatest integer less than or equal to λ. The set of all values of λ for which the system of linear equations $x + y + z = 4$, $3x + 2y + 5z = 3$, $9x + 4y + (28 + [\lambda]) z = [\lambda]$ has a solution is:

a) $\mathbb{R}$
b) $(-\infty, -9) \cup (-9, \infty)$
c) $[-9, -8)$
d) $(-\infty, -9) \cup (-8, \infty)$

11) The set of all values of $k > -1$, for which the equation $\left(3x^2 + 4x + 3\right)^2 - (k + 1)\left(3x^2 + 4x + 3\right)\left(3x^2 + 4x + 2\right) + k\left(3x^2 + 4x + 2\right)^2 = 0$ has real roots, is:

a) $\left(1, \frac{5}{2}\right]$
b) $[2, 3)$
c) $\left[-\frac{1}{2}, 1\right)$
d) $\left(\frac{1}{2}, \frac{3}{2}\right] - \{1\}$

12) A box open from top is made from a rectangular sheet of dimension $a \times b$ by cutting squares each of side x from each of the four corners and folding up the flaps. If the volume of the box is maximum, then x is equal to:

a) $\frac{a+b-\sqrt{a^2+b^2-ab}}{12}$
b) $\frac{a+b-\sqrt{a^2+b^2+ab}}{6}$
c) $\frac{a+b-\sqrt{a^2+b^2-ab}}{6}$
d) $\frac{a+b+\sqrt{a^2+b^2-ab}}{6}$

13) The Boolean expression $(p \wedge q) \implies ((r \wedge q) \wedge p)$ is equivalent to:

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

14) Let $\mathbb{Z}$ be the set of all integers,
$A = \left\{(x, y) \in \mathbb{Z} \times \mathbb{Z} : (x - 2)^2 + y^2 \leq 4\right\}$,

$B = \left\{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x^2 + y^2 \le 4\right\}$,
$C = \left\{(x, y) \in \mathbb{Z} \times \mathbb{Z} : (x-2)^2 + (y-2)^2 \le 4\right\}$,
If the total number of relations from $A \cap B$ to $A \cap C$ is 2^p, then the value of p is:

a) 16
b) 25
c) 49
d) 9

15) The area of the region bounded by the parabola $(y-2)^2 = (x-1)$, the tangent to it at the point whose ordinate is 3 and the x-axis is:

a) 9
b) 10
c) 4
d) 6