01-02-2023 s1

EE24BTECH11027-satwikagv

1)

$$\lim_{n\to\infty}\left(\frac{1}{1+n}+\frac{1}{2+n}+\frac{1}{3+n}+\cdots+\frac{1}{2n}\right)$$

is equal to :-

a) 0
b) $\log_e(2)$
c) $\log_e(\frac{3}{2})$
d) $\log_e(\frac{2}{3})$

2) The negation of the expression $q \vee ((\neg q) \wedge p)$ is equivalent to

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

3) In a binomial distribution $\mathbf{B}(n, p)$, the sum and product of the mean and variance are 5 and 6 respectively,then find $6(n + p - q)$ is equal to :-

a) 51
b) 52
c) 53
d) 50

4) The sum to 10 terms of the series $\frac{1}{1+1^2+1^4}+\frac{2}{1+2^2+2^4}+\frac{3}{1+3^2+3^4}+\ldots$ is :-

a) $\frac{59}{111}$
b) $\frac{55}{111}$
c) $\frac{56}{111}$
d) $\frac{58}{111}$

5) The value is $\frac{1}{1!50!}+\frac{1}{3!48!}+\frac{1}{5!46!}+\cdots+\frac{1}{49!2!}+\frac{1}{51!1!}$ is

a) $\frac{2^{50}}{50!}$
b) $\frac{2^{50}}{51!}$
c) $\frac{2^{51}}{51!}$
d) $\frac{2^{51}}{50!}$

6) If the orthocentre of the triangle, whose vertices are $(1, 2)$,$(2, 3)$ and $(3, 1)$ is (α, β), then the quadratic equation whose roots are $\alpha + 4\beta$ and $4\alpha + \beta$,is

a) $x^2 - 19x + 90 = 0$
b) $x^2 - 18x + 80 = 0$
c) $x^2 - 22x + 120 = 0$
d) $x^2 - 20x + 99 = 0$

7) For a triangle ABC, the value of $\cos 2A + \cos 2B + \cos 2C$ is least.If its inradius is 3 and incentre is M, then which of the following is NOT correct?

a) Perimeter of ΔABC is $18\sqrt{3}$
b) $\sin 2A + \sin 2B + \sin 2C = \sin A + \sin B + \sin C$
c) $\overrightarrow{MA}.\overrightarrow{MB} = -18$
d) area of ΔABC is $\frac{27\sqrt{3}}{2}$

8) The combined equation of the two lines $ax + by + c = 0$ and $a'x + b'y + c' = 0$can be written as $(ax + by + c)(a'x + b'y + c') = 0$.The equation of the angle bisectors of the lines represented by the equation $2x^2 + xy - 3y^2 = 0$ is

a) $3x^2 + 5xy + 2y^2 = 0$
b) $x^2 - y^2 + 10xy = 0$
c) $3x^2 + xy - 2y^2 = 0$
d) $x^2 - y^2 - 10xy = 0$

9) The shortest distance between the lines $\frac{x-5}{1} = \frac{y-2}{2} = \frac{z-4}{-3}$ and $\frac{x+3}{1} = \frac{y+5}{4} = \frac{z-1}{-5}$

a) $7\sqrt{3}$
b) $5\sqrt{3}$
c) $6\sqrt{3}$
d) $4\sqrt{3}$

10) Let S denote the set of all real values of λ such that the system of equations

$$\lambda x + y + z = 1$$
$$x + \lambda y + z = 1$$
$$x + y + \lambda z = 1$$

is inconsistent, then $\sum_{\lambda \in S} \left(\left|\lambda^2\right| + |\lambda|\right)$ is equal to

a) 2
b) 12
c) 4
d) 6

11) Let $S = \left\{x : x \in \mathbb{R} and \left(\sqrt{3} + \sqrt{2}\right)^{x^2-4} + \left(\sqrt{3} - \sqrt{2}\right)^{x^2-4} = 10\right\}$. Then $n(S)$ is equal to

a) 2
b) 4
c) 6
d) 10

12) Let S be the set of all solutions of the equation $\cos^{-1} 2x - 2\cos^{-1}\sqrt{1-x^2} = \pi, x \in \left[\frac{-1}{2}, \frac{1}{2}\right]$ Then $\sum_{x \in S} 2\sin^{-1}\left(x^2 - 1\right)$ is equal to

a) 0
b) $\frac{-2\pi}{3}$
c) $\pi - \sin^{-1}\frac{\sqrt{3}}{4}$
d) $\pi - 2\sin^{-1}\frac{\sqrt{3}}{4}$

13) If the center and radius of the circle $\left|\frac{z-2}{z-3}\right| = 2$ are respectively (α, β) and γ, then $3(\alpha + \beta + \gamma)$ is equal to

a) 11
b) 9
c) 10
d) 12

14) If $y = y(x)$ is the solution curve of the differential equation $\frac{dy}{dx} + y\tan x = x\sec x, 0 \leq x \leq \frac{\pi}{3}, y(0) = 1$, then $y\left(\frac{\pi}{6}\right)$ is equal to

a) $\frac{\pi}{12} - \frac{\sqrt{3}}{2}\log_e\left(\frac{2}{e\sqrt{3}}\right)$
b) $\frac{\pi}{12} + \frac{\sqrt{3}}{2}\log_e\left(\frac{2\sqrt{3}}{e}\right)$
c) $\frac{\pi}{12} - \frac{\sqrt{3}}{2}\log_e\left(\frac{2\sqrt{3}}{e}\right)$
d) $\frac{\pi}{12} + \frac{\sqrt{3}}{2}\log_e\left(\frac{2}{e\sqrt{3}}\right)$

15) Let R be a relation on $\mathbb{R}$, given by $R = \left\{(a,b) : 3a - 3b + \sqrt{7}\text{is an irrational number}\right\}$. Then R is

a) Reflexive but neither symmetric nor transitive
b) Reflexive and transitive but not symmetric
c) Reflexive and symmetric but not transitive
d) An equivalence relation