

Studentpad

JEE - Main Full Portion 2020-21

Time : 120 Min

Maths : Full Portion Paper

Marks : 150

01) The first four terms in the expansion of $(1-x)^{3/2}$ are

- 1) $1 - \frac{3}{2}x + \frac{3}{8}x^2 + \frac{x^3}{16}$
- 2) $1 - \frac{3}{2}x + \frac{3}{8}x^2 - \frac{1}{16}x^3$
- 3) $1 - \frac{3}{2}x - \frac{3}{8}x^2 - \frac{x^3}{16}$
- 4) None of these

02) The four distinct points $(0, 0)$, $(2, 0)$, $(0, -2)$ and $(k, -2)$ are con-cyclic, if $k =$

- 1) -2
- 2) 0
- 3) 1
- 4) 2

03) Consider the following statements

- (1) Mode can be computed from histogram
- (2) Median is not independent of change of scale
- (3) Variance is independent of change of origin and scale

Which of these is/are correct

- 1) Only (1)
- 2) Only (1) and (2)
- 3) Only (2)
- 4) (1), (2) and (3)

04) If the parabola $y = (a-b)x^2 + (b-c)x + (c-a)$ touches the x -axis then mark the correct for the line $ax + by + c = 0$.

- 1) Always passes through a fixed point
- 2) Always has negative slope
- 3) It is always perpendicular to x -axis
- 4) Represents the family of parallel lines

05) $\int \frac{1}{\sqrt{1+\sin x}} dx =$

- 1) $\frac{1}{2\sqrt{2}} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$
- 2) $\sqrt{2} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$
- 3) $\frac{1}{\sqrt{2}} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$
- 4) $2\sqrt{2} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$

06) A box contains 15 tickets numbered 1, 2, 15. Seven tickets are drawn at random one after the other with replacement. The probability that

the greatest number on a drawn ticket is 9, is

- 1) $\left(\frac{9}{10}\right)^6$
- 2) $\left(\frac{8}{15}\right)^7$
- 3) $\left(\frac{3}{5}\right)^7$
- 4) None of these

07) Distance between the pair of lines represented by the equation $x^2 - 6xy + 9y^2 + 3x - 9y - 4 = 0$ is

- 1) $\frac{1}{2}$
- 2) $\sqrt{\frac{5}{2}}$
- 3) $\frac{1}{\sqrt{10}}$
- 4) $\frac{15}{\sqrt{10}}$

08) $\tan\left[\frac{1}{2}\cos^{-1}\left(\frac{\sqrt{5}}{3}\right)\right] =$

- 1) $\frac{2}{3+\sqrt{5}}$
- 2) $\frac{3+\sqrt{5}}{2}$
- 3) $\frac{3-\sqrt{5}}{2}$
- 4) Both (1) and (3)

09) ${}^nC_r + {}^{n-1}C_r + \dots + {}^rC_r =$

- 1) 2^n
- 2) ${}^{n+1}C_r$
- 3) ${}^{n+2}C_r$
- 4) ${}^{n+1}C_{r+1}$

10) The graph of a quadratic polynomial (parabola) opens downward, with y -intercept 10 and x -intercepts -1 and 5. If the point $P(8, k)$ lies on the graph of the parabola, then find the value of k .

- 1) -8
- 2) -54
- 3) -27
- 4) -60

11) P, Q, R and S are four coplanar points on the sides AB, BC, CD and DA of a skew quadrilateral.

The product $\frac{AP}{PB} \cdot \frac{BQ}{QC} \cdot \frac{CR}{RD} \cdot \frac{DS}{SA} = ?$

- 1) -2
- 2) 2
- 3) -1
- 4) 1

$$12) \begin{vmatrix} x & x^2 & yz \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = ?$$

- 1) $(x+y)(y+z)(z+x)(xy+yz+zx)$
- 2) $(x-y)(y-z)(z-x)(xy+yz+zx)$
- 3) $(x-y)(y-z)(z-x)(x+y+z)$
- 4) None of the above

13) If OA and OB are equal perpendicular chord of the circles $x^2 + y^2 - 2x + 4y = 0$, then what is the equation of OA and OB are (where, O is origin)

- 1) $3x + y = 0$ and $3y - x = 0$
- 2) $3x + y = 0$ and $3x - y = 0$
- 3) $x + 3y = 0$ and $y - 3x = 0$
- 4) $x + y = 0$ or $x - y = 0$

14) What is the maximum value of

$$\cos^2\left(\frac{\pi}{3} - x\right) - \cos^2\left(\frac{\pi}{3} + x\right) ?$$

- 1) $\frac{3}{2}$
- 2) $\frac{1}{2}$
- 3) $\frac{\sqrt{3}}{2}$
- 4) $-\frac{\sqrt{3}}{2}$

15) If the sum of the coefficients in the expansion of $(x+y)^n$ is 1024, then the value of the greatest coefficient in the expansion is

- 1) 120
- 2) 210
- 3) 252
- 4) 356

16) If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b, c are in G.P., then x, y, z will be in

- 1) H.P.
- 2) G.P.
- 3) A.P.
- 4) None of these

17) The solution of the differential equation

$$\frac{dy}{dx} + \frac{y}{x} = x^2 \text{ is}$$

- 1) $xy = 4x^4 + c$

$$2) \frac{1}{4}xy = x^4 + c$$

$$3) xy = x^4 + c$$

$$4) 4xy = x^4 + c$$

$$18) \int_1^{\sqrt{3}} \frac{1}{1+x^2} dx \text{ is equal to}$$

- 1) $\pi/3$
- 2) $\pi/4$
- 3) $\pi/6$
- 4) $\pi/12$

19) If $f: \mathbb{R} \rightarrow \mathbb{R}$, then the range of the function

$$f(x) = \frac{x^2}{x^2 + 1} \text{ is}$$

- 1) $\mathbb{R} \times \mathbb{R}$
- 2) \mathbb{R}
- 3) \mathbb{R}^+
- 4) \mathbb{R}^-

20) The function $f(x) = 2x^3 - 3x^2 - 12x + 4$ has

- 1) one maximum and one minimum.
- 2) two minima.
- 3) two maxima.
- 4) no maxima and minima.

21) If $\cos \alpha + \cos \beta + \cos \gamma = \sin \alpha + \sin \beta + \sin \gamma = 0$, then $\cos 3\alpha + \cos 3\beta + \cos 3\gamma$ equals to

- 1) $3 \sin(\alpha + \beta + \gamma)$
- 2) $3 \cos(\alpha + \beta + \gamma)$
- 3) $\cos(\alpha + \beta + \gamma)$
- 4) 0

22) An AND gate is the Boolean function defined by

- 1) $f(x_1, x_2) = x_2, x_1, x_2 \in \{0, 1\}$
- 2) $f(x_1, x_2) = x_1, x_1, x_2 \in \{0, 1\}$
- 3) $f(x_1, x_2) = x_1 + x_2, x_1, x_2 \in \{0, 1\}$
- 4) $f(x_1, x_2) = x_1 : x_2, x_1, x_2 \in \{0, 1\}$

$$23) \lim_{x \rightarrow 1} \frac{\sqrt{1 - \cos 2(x-1)}}{x-1}$$

- 1) exists and it equals $-\sqrt{2}$.
- 2) exists and it equals $\sqrt{2}$.
- 3) does not exist because $x-1 \rightarrow 0$.
- 4) does not exist because left hand limit is not equal to right hand limit.

$$24) \text{ If } 5 \cos 2\theta + 2 \cos^2 \frac{\theta}{2} + 1 = 0, -\pi < \theta < \pi, \text{ then } \theta =$$

- 1) $\frac{\pi}{3}$
- 2) $\cos^{-1} \frac{3}{5}$
- 3) $\frac{\pi}{3}, \cos^{-1} \frac{3}{5}$

4) $\frac{\pi}{3}, \pi - \cos^{-1} \frac{3}{5}$

25) If $a+b+c=0$ and $|a|=3, |b|=5$ and $|c|=7$, then what is the angle between a and b ?

1) $\frac{5\pi}{3}$

2) $\frac{2\pi}{3}$

3) $\frac{\pi}{3}$

4) $\frac{\pi}{6}$

26) If $\begin{vmatrix} y+z & x-z & x-y \\ y-z & z+x & y-x \\ z-y & z-x & x+y \end{vmatrix} = kxyz$, then the value

of k is

1) 8

2) 6

3) 4

4) 2

27) Equation of diameter of parabola $y^2 = x$ corresponding to the chord $x - y + 1 = 0$ is

1) $y = 1$

2) $2y = 1$

3) $2y = 3$

4) $2y = 5$

28) The distance of the point $B(i + 2j + 3k)$ from the line which is passing through $A(4i + 2j + 2k)$ and which is parallel to the vector $\vec{C} = 2i + 3j + 6k$ is

1) $\sqrt{10}$

2) 10

3) 100

4) None of these

29) If a vertex of an equilateral triangle is the origin and the side opposite to it has the equation $x + y = 1$ then what is the orthocentre of the triangle?

1) $\left(\frac{2}{3}, \frac{2}{3}\right)$

2) $\left(\frac{\sqrt{2}}{3}, \frac{\sqrt{2}}{3}\right)$

3) $\left(\frac{1}{3}, \frac{1}{3}\right)$

4) None of these

30) Conjugate of $1+i$ is

1) $1+i$

2) $1-i$

3) 1

4) i