MATHS

BOOKS - MCGROW HILL EDUCATION MATHS (HINGLISH)

JEE (MAIN) 2020 QUESTION PAPER (7TH JAN - AFTERNOON)

Multiple Choice Question

1. v34

A. $2\sqrt{5}$

B. $2\sqrt{7}$

C. $2\sqrt{2}$

D. 4

Answer: B

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2. Let A, B, C and D be four non-empty sets. The contrapositive statement of "If $A \subseteq B$ and $B \subseteq D$, then $A \subseteq C$" is :

A. If $A \subseteq C$, then $B \subset A$ and $D \subset B$

B. If $A \not\subseteq C$, then $A \subseteq B$ and $B \subseteq D$

C. If $A \not\subseteq C$, then $A \not\subseteq B$ and $B \subseteq D$

D. If $A \not\subseteq C$, then $A \not\subseteq B$ or $B \not\subseteq D$

Answer: D

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3. The coefficient of x^7 in the expression $(+ x)^{10} + x(1 + x)^9 + x^2(1 + x)^8 + \ldots + x^{10}$ is:

A. 420

B. 330

C. 210

D. 120

Answer: B

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4. In a workshop,there are five machines.The probability of any one of them to be out of service on a day is $\frac{1}{4}$.If the probability that at

most two machines will be out of service on the same day is $\left(\frac{3}{4}\right)^3 k$,then$k$ is equal to

A. $\frac{17}{2}$

B. 4

C. $\frac{17}{4}$

D. $\frac{17}{8}$

Answer: D

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5. The locus of the mid-points of the perpendiculars drawn from points on the line $x = 2y$ to the line $x = y$ is:

A. $2x - 3y = 0$

B. $3x - 2y = 0$

C. $5x - 7y = 0$

D. $7x - 5y = 0$

Answer: C

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6. Let $4\alpha \int_{-1}^{2} e^{-\alpha|x|} dx = 5$, then α =

A. $\log_e 2$

B. $\log_e \sqrt{2}$

C. $\log_e (4/3)$

D. $\log_e (3/2)$

Answer: A

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7. If the sum of the first 40 terms of the series,

$3 + 4 + 8 + 9 + 13 + 14 + 18 + 19 + \ldots$ is

(102)m, then m is equal to :

A. 10

B. 25

C. 5

D. 20

Answer: D

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8. If $z = \frac{3 + i\sin\theta}{4 - i\cos\theta}$ is purely real and $\theta \in \left(\frac{\pi}{2}, \pi\right)$,then $arg(\sin\theta + i\cos\theta)$ is -

A. $\pi - \tan^{-1}\left(\frac{4}{3}\right)$

B. $-\tan^{-1}\left(\frac{3}{4}\right)$

C. $\pi - \tan^{-1}\left(\frac{3}{4}\right)$

D. $\tan^{-1}\left(\frac{4}{3}\right)$

Answer: A

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9. Let $A = [a_{ij}]$ and $B = [b_{ij}]$ be two 3×3 real matrices such that $b_{ij} = (3)(i + j - 2)a_{ji}$, where i, j = 1,2,3. If the determinant of B is 81, then the determinant of A is :

A. $1/9$

B. $1/81$

C. $1/3$

D. 3

Answer: A

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10. Let f(x) is a five degree polynomial which has critical points $x = \pm 1$ and $\lim_{x \to 2} \left(2 + \frac{f(x)}{x^3}\right) = 4$ then which one is incorrect.

A. $f(1) - 4f(-1) = 4$

B. $x = 1$ is a point of maxima and $x = -1$ is a point of miniumu of f.

C. f is an odd function.

D. $x = 1$ is a point of minima and $x = -1$ is a point of maxima of f.

Answer: D

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11. The number of ordered pairs (r, k) for which $6\left({}^{35}C_r\right) = \left(k^2 - 3\right)\left({}^{36}C_{r+1}\right)$, where k is an integer, is:

A. 4

B. 6

C. 2

D. 3

Answer: A

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12. Let $a_1, a_2, a_3, \ldots$ be a G P such that $a_1 < 0, a_1 + a_2 = 4$ and $a_3 + a_4 = 16$. If $\sum_{i=1}^{9} a_i = 4\lambda$, then λ is equal to "

A. 171

B. $511/3$

C. -171

D. -513

Answer: D

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13. Let a, b and c be three unit vectors such that $a+b+c=0$. If $\lambda = a \cdot b + b \cdot c + c \cdot a$

and $d = a \times b + b \times c + c \times a$, then the ordered pair, (λ, d) is equal to :

A. $\left(\frac{3}{2}, 3a \times c\right)$

B. $\left(-\frac{3}{2}, 3c \times b\right)$

C. $\left(-\frac{3}{2}, 3a \times b\right)$

D. $\left(\frac{3}{2}, 3b \times c\right)$

Answer: C

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14. Let $y = y(x)$ be the solution curve of the differential equation $(y^2 - x)\frac{dy}{dx} = 1$ satisfying $y(0) = 1$. This curve intersects the x -axis at a point whose abscissa is

A. $2 + e$

B. 2

C. $2 - e$

D. $-e$

Answer: C

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15. If θ_1 and θ_2 be respectively the smallest and the largest values of θ in $(0, 2\pi) - (\pi)$ which satisfy the equation, $2\cot^2\theta - \frac{5}{\sin\theta} + 4 = 0$, then $\int_{\theta_1}^{\theta_2} \cos^2 3\theta d\theta$ is equal to :

A. $\frac{2\pi}{3}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{3} + \frac{2}{6}$

D. $\frac{\pi}{9}$

Answer: B

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16. Let α and β be the roots of the equation $x^2 - x - 1 = 0$ .If $p_k = (\alpha)^k + (\beta)^k, k \geq 1$ then which one of the following statements is not true?`

A. $(p_1 + p_2 + p_3 + p_4 + p_5) = 26$

B. $p_5 = 11$

C. $p_5 = p_2 \cdot p_3$

D. $p_2 = p_5 - p_4$

Answer: C

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17. The area (in sq. units) of the region $\{(x, y) \in R^2 l 4x^2 \leq y \leq 8x + 12\}$ is :

A. $\frac{125}{3}$

B. $\frac{128}{3}$

C. $\frac{124}{3}$

D. $\frac{127}{3}$

Answer: B

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18. The value of c in the Lagrange's mean value theorem for the function $f(x) = x^3 - 4x^2 + 8x + 11$, when $x \in [0, 1]$ is :

A. $\frac{4 - \sqrt{7}}{3}$

B. $\frac{2}{3}$

C. $\frac{\sqrt{7}-2}{3}$

D. $\frac{4-\sqrt{5}}{3}$

Answer: A

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19. if $y\sqrt{1-x^2}=k-x\sqrt{1-y^2}$ and $y\left(\frac{1}{2}\right)=-\frac{1}{4}$, then $\frac{dy}{dx}atx=\frac{1}{2}$

A. $-\frac{\sqrt{5}}{2}$

B. $\frac{\sqrt{5}}{2}$

C. $-\frac{\sqrt{5}}{4}$

D. $\frac{2}{\sqrt{5}}$

Answer: A

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20. Let the tangents drawn from the origin to the circle, $x^2 + y^2 - 8x - 4y + 16 = 0$ touch it at the points A and B. Then $(AB)^2$ is equal to :

A. $\frac{3}{25}$

B. $\frac{64}{5}$

C. $\frac{52}{5}$

D. $\frac{56}{5}$

Answer: B

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21. If system of equation

$x + y + z = 6$

$x + 2y + 3z = 10$

$3x + 2y + \lambda z = \mu$ has more than two solutions.

Find $(\mu - \lambda^{\square})$

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22. If $Q\left(\frac{5}{3}, \frac{7}{3}, 17, 3\right)$ is foot of perpendicular drawn from $P(1, 0, 3)$ on a line L and if line L is passing through $(\alpha, 7, 1)$, then value of α is

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23. If the function

$$f(x) = \begin{cases} \frac{\sin^2 ax}{x^2}, & \text{when } x \neq 0 \\ k, & \text{when } x = 0 \end{cases}$$ is

continuous at x = 0 then k = ?

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24. If the mean and variance of eight numbers 3, 7, 9, 12, 13, 20, x and y be 10 and 25 respectively, then x.y is equal to _____.

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25. Let X = {x : 1 le x le 50, x in N} A = {x: x is multiple of 2} B = {x: x is multiple of 7} Then find number of elements in the smallest subset of X which contain elements of both A and B

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