DU BTech IT N Mathematical Innovations

Topic:- DU_J19_BTECH_T1

1) **Directions for questions** : The accompanying figure (i) shows the graph of a function $f(x)$ with domain [-3, 4] and range [-1, 2].

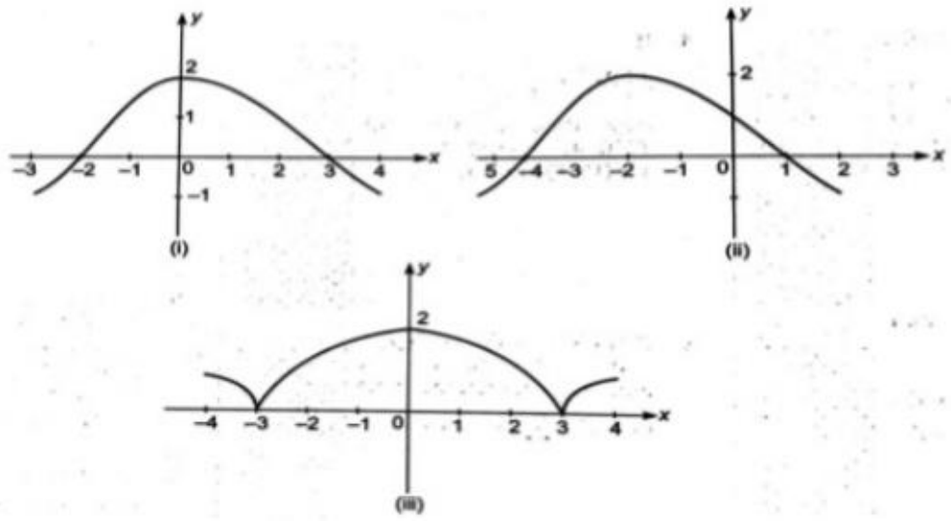


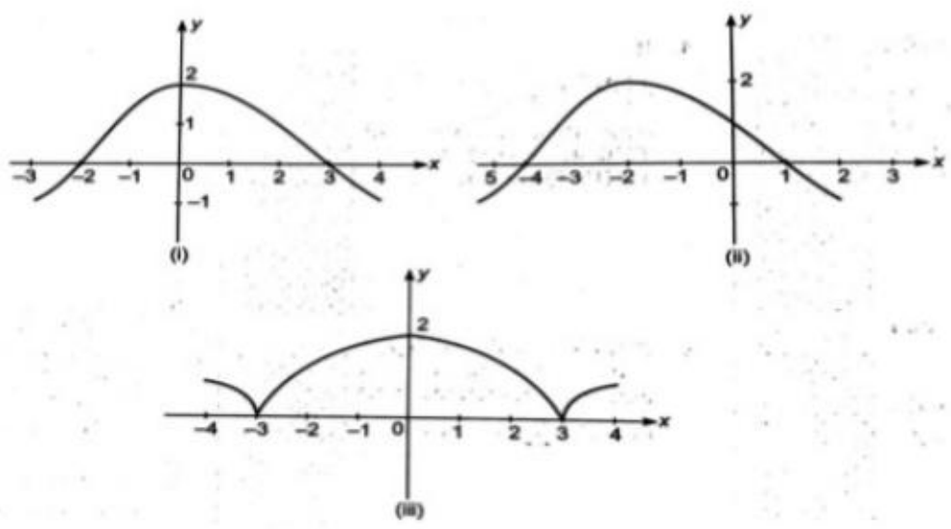
Figure (iii) represents the graph of the function [Question ID = 13738]

1. $|f(|x|)|$ [Option ID = 24952]
2. $|f(x)|$ [Option ID = 24951]
3. $f(|x|)$ [Option ID = 24950]
4. $f(x)$ [Option ID = 24949]

Correct Answer :-

- $|f(|x|)|$ [Option ID = 24952]

2) **Directions for questions** : The accompanying figure (i) shows the graph of a function $f(x)$ with domain [-3, 4] and range [-1, 2].



The points of intersection of Figure (iii) and $(2x-6)^2+4y^2=49$ are

[Question ID = 13739]

1. 6 [Option ID = 24955]

2. 2 [Option ID = 24953]
3. 1 [Option ID = 24956]
4. 4 [Option ID = 24954]

Correct Answer :-

- 1 [Option ID = 24956]

3) Directions for questions : The accompanying figure (i) shows the graph of a function $f(x)$ with domain [-3, 4] and range [-1, 2].

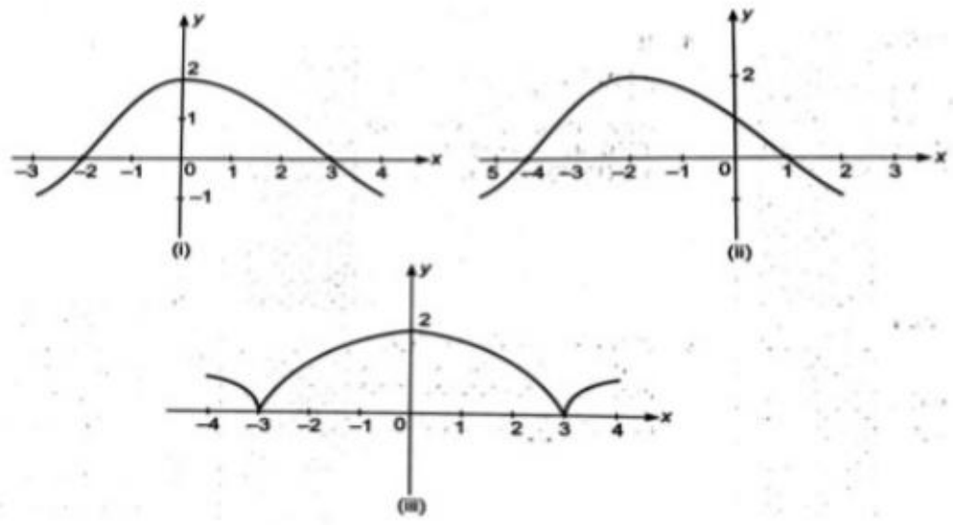


Figure (ii) represents the graph of the function [Question ID = 13737]

1. $f(x-2)$ [Option ID = 24946]
2. $f(x+2)$ [Option ID = 24947]
3. $f(x)$ [Option ID = 24945]
4. $f(x-1)+1$ [Option ID = 24948]

Correct Answer :-

- $f(x+2)$ [Option ID = 24947]

Topic:- DU_J19_BTECH_T2

1) Let z be a complex number such that the imaginary part of z is non-zero and a = z2 + z + 1 is real. Then a cannot take the value [Question ID = 36452]

1. 1/3 [Option ID = 55804]
2. -1 [Option ID = 55803]
3. 1/2 [Option ID = 55805]
4. 3/4 [Option ID = 55806]

Correct Answer :-

2) A point is selected at random from the interior of a circle. The probability that the point is close to the center than the boundary of the circle is [Question ID = 13746]

1. 1/4 [Option ID = 24984]
2. 1/3 [Option ID = 24983]
3. 1/2 [Option ID = 24982]
4. 3/4 [Option ID = 24981]

Correct Answer :-

- 1/4 [Option ID = 24984]

3) A variable triangle is inscribed in a circle of radius *R*. If the rate of change of a side is *R* times the rate of change of opposite angle, then that angle is [Question ID = 13758]

1. $\frac{\pi}{4}$ [Option ID = 25030]
2. $\frac{\pi}{2}$ [Option ID = 25032]
3. $\frac{\pi}{3}$ [Option ID = 25031]

4. $\frac{\pi}{6}$ [Option ID = 25029]

Correct Answer :-

- $\frac{\pi}{3}$ [Option ID = 25031]

4) Five persons entered the lift cabin on the ground floor of an 8 floor house. Suppose that each of them have an independent and equal probability to leave the cabin at any floor beginning with the first. Then the probability of all 5 persons leaving at different floors is [Question ID = 13747]

1. $\frac{{}^{7}C_{5}}{7^{5}}$ [Option ID = 24986]
2. $\frac{{}^{5}P_{5}}{5^{5}}$ [Option ID = 24988]
3. $\frac{{}^{7}P_{5}}{7^{5}}$ [Option ID = 24985]
4. $\frac{6}{{}^{6}P_{5}}$ [Option ID = 24987]

Correct Answer :-

- $\frac{{}^{7}P_{5}}{7^{5}}$ [Option ID = 24985]

5) Given that c is an integer, the value of $c+2$ for which the area of the figure bounded by the curve $y = 8x^2 - x^5$,the straight lines $x = 1, x = c$ and X-axis is equal to $\frac{16}{3}$, is

[Question ID = 13762]

1. 2 [Option ID = 25045]
2. -1 [Option ID = 25048]
3. 1 [Option ID = 25046]
4. 3 [Option ID = 25047]

Correct Answer :-

- 1 [Option ID = 25046]

6) If $f(x)$ is a polynomial function of the second degree such that $f(-3) = 6, f(0) = 6$ and $f(2) = 11$, then the graph of the function $f(x)$ cuts the ordinate $x = 1$ at the point

[Question ID = 13741]

1. (1,8) [Option ID = 24961]
2. (1,4) [Option ID = 24963]
3. (1,-2) [Option ID = 24962]
4. (1,2) [Option ID = 24964]

Correct Answer :-

- (1,8) [Option ID = 24961]

7) If the equations $x^2 + 2x + 3 = 0$ and $ax^2 + bx + c = 0, a, b, c \in R$, have a common root, then $a : b : c$ is

[Question ID = 13776]

1. $1 : 2 : 3$ [Option ID = 25104]
2. $3 : 2 : 1$ [Option ID = 25101]
3. $3 : 1 : 2$ [Option ID = 25103]
4. $1 : 3 : 2$ [Option ID = 25102]

Correct Answer :-

- $1:2:3$ [Option ID = 25104]

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8) The value of the expression

$$2\left(1+\frac{1}{w}\right)\left(1+\frac{1}{w^2}\right)+3\left(2+\frac{1}{w}\right)\left(2+\frac{1}{w^2}\right)+4\left(3+\frac{1}{w}\right)\left(3+\frac{1}{w^2}\right)+\ldots+(n+1)\left(n+\frac{1}{w}\right)\left(n+\frac{1}{w^2}\right),$$

where w is an imaginary cube root of unity, is

[Question ID = 13770]

1. $\frac{n(n^2+2)}{3}$ [Option ID = 25077]
2. $\frac{n^2(n-1)^2+n}{4}$ [Option ID = 25080]
3. $\frac{n(n^2-2)}{3}$ [Option ID = 25078]
4. $\frac{n^2(n+1)^2+4n}{4}$ [Option ID = 25079]

Correct Answer :-

- $\frac{n^2(n+1)^2+4n}{4}$ [Option ID = 25079]

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9) Let f and g be differential functions satisfying $g'(a)=2$, $g(a)=b$ and $fog=I$ (identity function). Then $f'(b)$ is equal to

[Question ID = 25891]

1. 1/2 [Option ID = 43562]
2. 1/4 [Option ID = 43561]
3. 2 [Option ID = 43559]
4. 2/3 [Option ID = 43560]

Correct Answer :-

- 1/2 [Option ID = 43562]

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10) Let $f(x)=\int e^x(x-1)(x-2)dx$, then f decreases in the interval

[Question ID = 24956]

1. $(-2,-1)$ [Option ID = 39820]
2. $(1,2)$ [Option ID = 39821]
3. $(2,\infty)$ [Option ID = 39822]
4. $(-\infty,-2)$ [Option ID = 39819]

Correct Answer :-

- $(1,2)$ [Option ID = 39821]

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11) Let S be the set of all non-zero real numbers α such that the quadratic equation $\alpha x^2-x+\alpha=0$ has two distinct real roots x_1 and x_2 satisfying the inequality $|x_1-x_2|<1$. Which of the following interval is a subset of S?

[Question ID = 24958]

1. $\left(-\frac{1}{\sqrt{5}},\frac{1}{\sqrt{5}}\right)$ [Option ID = 39830]
2. $\left(-\frac{1}{2},-\frac{1}{\sqrt{5}}\right)$ [Option ID = 39827]
3. $\left(-\frac{1}{\sqrt{5}},0\right)$ [Option ID = 39828]
4. $\left(0,\frac{1}{\sqrt{5}}\right)$ [Option ID = 39829]

Correct Answer :-

- $\left(-\frac{1}{2},-\frac{1}{\sqrt{5}}\right)$ [Option ID = 39827]

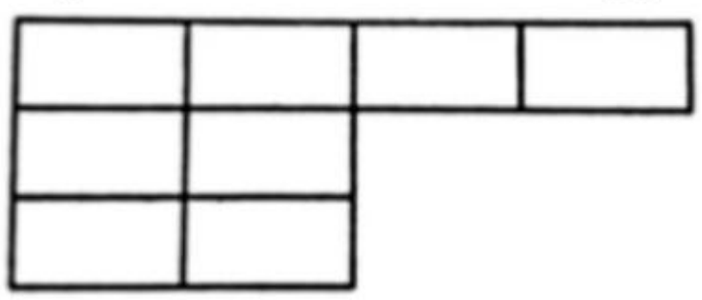
12) Let **R** be the set of real numbers. If $f: R \to R$ is a function such that $|f(x) - f(p)|^2 \leq |x - y|^3$, for all $x, y \in R$, then $f'(x)$ is equal to

[Question ID = 25892]

1. 0 [Option ID = 43566]
2. X [Option ID = 43565]
3. 1 [Option ID = 43564]
4. $f(x)$ [Option ID = 43563]

Correct Answer :-

13) The number of different ways the letters of the word *VECTOR* can be placed in the 8 boxes of the figure given below such that no row is empty is equal to



[Question ID = 13750]

1. 6! [Option ID = 24999]
2. 26 x 6! [Option ID = 24998]
3. 26 [Option ID = 24997]
4. 2! x 6! [Option ID = 25000]

Correct Answer :-

- 26 x 6! [Option ID = 24998]

14) If $a \in [-20.0]$, then the probability that the graph of the function $y = 16\,x^2 + 8(a+5)x - 7a - 5$ is strictly above the *x-axis* is

[Question ID = 13751]

1. 1/2 [Option ID = 25001]
2. 1/17 [Option ID = 25002]
3. 17/20 [Option ID = 25003]
4. 13/20 [Option ID = 25004]

Correct Answer :-

- 13/20 [Option ID = 25004]

15) If $f(x) = \frac{sin^2(\pi x)}{1+\pi^x}$, then $\int f(x) + f(-x)dx$ is equal to

[Question ID = 24953]

1. $\frac{x}{2}-\frac{cos\pi x}{2\pi}+C$ [Option ID = 39809]
2. $\frac{x}{2}-\frac{sin2\pi x}{4\pi}+C$ [Option ID = 39810]
3. 0 [Option ID = 39807]
4. $x+C$ [Option ID = 39808]

Correct Answer :-

- $\frac{x}{2}-\frac{sin2\pi x}{4\pi}+C$ [Option ID = 39810]

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16) Let $f(z)=\sin z$ and $g(z)=\cos z$. If $*$ denotes a composition of functions, then the value of $(f+ig)*(f-ig)(z)$ (where $i=\sqrt{-1}$) is

[Question ID = 13768]

1. $ie^{-e^{-iz}}$ [Option ID = 25072]
2. $ie^{-e^{iz}}$ [Option ID = 25070]
3. $ie^{e^{iz}}$ [Option ID = 25069]
4. $ie^{e^{-iz}}$ [Option ID = 25071]

Correct Answer :-

- $ie^{e^{-iz}}$ [Option ID = 25071]

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17) If $y=f(x)$ is an odd differential function defined on $(-\infty,\infty)$ such that $f'(3)=-2$ then $f'(-3)$ equals

[Question ID = 24952]

1. 2 [Option ID = 39804]
2. 0 [Option ID = 39806]
3. -2 [Option ID = 39805]
4. 4 [Option ID = 39803]

Correct Answer :-

- -2 [Option ID = 39805]

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18) The equation $e^{\sin x}-e^{-\sin x}-4=0$ has

[Question ID = 13775]

1. No real roots [Option ID = 25098]
2. Infinite number of real roots [Option ID = 25097]
3. Exactly four real roots [Option ID = 25100]
4. Exactly one real root [Option ID = 25099]

Correct Answer :-

- No real roots [Option ID = 25098]

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19) If the function f is continuous and has the property $f(f(x))=1-x$, then the value of $f\left(\frac{1}{4}\right)+f\left(\frac{3}{4}\right)$ is

[Question ID = 13745]

1. 2 [Option ID = 24980]
2. 0 [Option ID = 24979]
3. -1 [Option ID = 24978]
4. 1 [Option ID = 24977]

Correct Answer :-

- 1 [Option ID = 24977]

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20)

If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less than $\sqrt{5}$, then the set of possible values of a is

[Question ID = 13774]

1. [4, 5) [Option ID = 25094]
2. (3, ∞) [Option ID = 25095]
3. (-∞, -3) [Option ID = 25096]
4. (-3, 3) [Option ID = 25093]

Correct Answer :-

- (-3, 3) [Option ID = 25093]

21)

The domain of the function $\frac{1}{\sqrt{{}^{10}C_{x-1} - 3\,{}^{10}C_x}}$ contains the points

[Question ID = 13744]

1. 9, 10, 12 [Option ID = 24974]
2. 9, 10, 11 [Option ID = 24973]
3. 9, 10 [Option ID = 24976]
4. All Natural numbers [Option ID = 24975]

Correct Answer :-

- 9, 10 [Option ID = 24976]

22)

If lines of regression of y on x and x on y are respectively $y = kx + 4$, $x = 4y + 5$, then which is true for k?

[Question ID = 24951]

1. $0 \le k \le 4$ [Option ID = 39799]
2. $0 \le k \le 1/4$ [Option ID = 39800]
3. $k > 1/4$ [Option ID = 39801]
4. $k < 1/4$ [Option ID = 39802]

Correct Answer :-

- $0 \le k \le 1/4$ [Option ID = 39800]

23)

The solution set of $f'(x) > g'(x)$, where $f(x) = \frac{1}{2}5^{2x+1}$ and $g(x) = 5^x + 4x\log_e 5$ is

[Question ID = 24954]

1. $(0, \infty)$ [Option ID = 39814]
2. $(0,1)$ [Option ID = 39812]
3. $(1, \infty)$ [Option ID = 39811]
4. $[0, \infty)$ [Option ID = 39813]

Correct Answer :-

- $(0, \infty)$ [Option ID = 39814]

24)

The tangent to the graph of the function $y = f(x)$ at the point with abscissa $x = 1$ form an angle of $\frac{\pi}{6}$, at the point x=2 an angle of $\frac{\pi}{3}$ and at the point x=3 an angle of $\frac{\pi}{4}$. The value of $\int_1^3 f'(x)f''(x)dx + \int_2^3 f''(x)dx$ is (given that $f''(x)$ is continuous)

[Question ID = 24955]

1. $\frac{3\sqrt{3}-1}{2}$ [Option ID = 39816]
2. 1 [Option ID = 39818]

3. $\frac{4-3\sqrt{3}}{3}$ [Option ID = 39817]

4. $\frac{4\sqrt{3}-1}{3\sqrt{3}}$ [Option ID = 39815]

Correct Answer :-

- $\frac{4-3\sqrt{3}}{3}$ [Option ID = 39817]

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25) Let S be the set of all triangles and R^+ be the set of positive real numbers. Then, the function $f: S \to R^+, f(\Delta) =$ area of the Δ, where $\Delta \in S$, is

[Question ID = 13743]

1. Surjective but not Injective [Option ID = 24970]
2. Injective as well as Surjective [Option ID = 24971]
3. Injective but nor Surjective [Option ID = 24969]
4. Neither Injective nor Surjective [Option ID = 24972]

Correct Answer :-

- Surjective but not Injective [Option ID = 24970]

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26) The fundamental period of $e^{\cos^4 \pi x + x - [x] + \cos^2 \pi x}$ is ([.] denotes the greatest integer function)

[Question ID = 13742]

1. 2 [Option ID = 24965]
2. 0 [Option ID = 24967]
3. -1 [Option ID = 24968]
4. 1 [Option ID = 24966]

Correct Answer :-

- 1 [Option ID = 24966]

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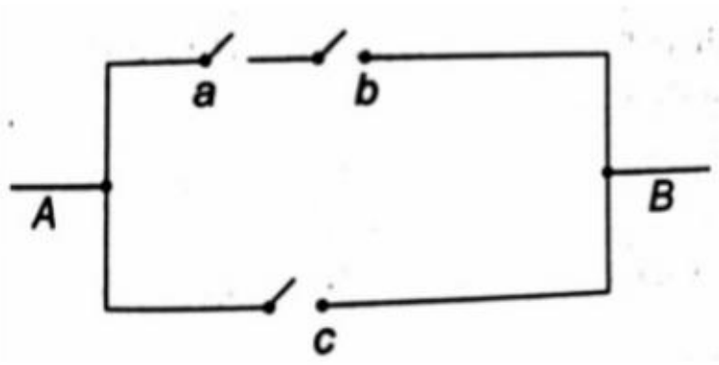
27) Consider the circuit



If the probability that each switch is closed is p, then the probability of current flowing through AB is

[Question ID = 13752]

1. $p^2 + p - 1$ [Option ID = 25006]
2. $p^2 + p + 1$ [Option ID = 25008]
3. $p^2 + p$ [Option ID = 25005]
4. $p^3 + p$ [Option ID = 25007]

Correct Answer :-

- $p^2 + p$ [Option ID = 25005]

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28) If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \left(\frac{dy}{dx}\right)$ equals

[Question ID = 13764]

1. 2 [Option ID = 25056]
2. 0 [Option ID = 25054]

3. -1 [Option ID = 25053]
4. 1 [Option ID = 25055]

Correct Answer :-

- 1 [Option ID = 25055]

29)

Let ω be the complex number $\cos\frac{2\pi}{3}+i\sin\frac{2\pi}{3}$. Then the number of distinct complex numbers z satisfying $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 0$ is equal to

[Question ID = 13772]

1. 2 [Option ID = 25086]
2. 1 [Option ID = 25085]
3. 3 [Option ID = 25087]
4. 4 [Option ID = 25088]

Correct Answer :-

- 1 [Option ID = 25085]

30) If

$I_n = \int cot^n x dx$ and $I_0 + I_1 + 2(I_2+\ldots+I_8) + I_9 + I_{10} = A\left(u + \frac{u^2}{2}+\ldots+\frac{u^9}{9}\right) +$ constant, where, $u = cotx$, then

[Question ID = 13760]

1. *A* is dependent on *x* [Option ID = 25040]
2. *A*=0 [Option ID = 25037]
3. *A*=-1 [Option ID = 25038]
4. *A*=1 [Option ID = 25039]

Correct Answer :-

- *A*=-1 [Option ID = 25038]

31)

The smallest positive integer n for which $\left(\frac{1+i}{1-i}\right)^n = 1$, where $i = \sqrt{-1}$, is a real number is

[Question ID = 13769]

1. 2 [Option ID = 25074]
2. 1 [Option ID = 25073]
3. 3 [Option ID = 25075]
4. 4 [Option ID = 25076]

Correct Answer :-

- 4 [Option ID = 25076]

32) A vector $\boldsymbol{a}$ has components $2p$ and 1 with respect to a rectangular Cartesian system. This system is rotated through a certain angle about the origin in the counter clockwise sense. With respect to new system, if $\boldsymbol{a}$ has component $p+1$ and 1, then

[Question ID = 13763]

1. $p = 1$ or $p = \frac{1}{3}$ [Option ID = 25051]
2. $p = 1$ or $p = -\frac{1}{3}$ [Option ID = 25050]
3. $p = 0$ [Option ID = 25049]

4. $p = 1 \text{ or } p = -1$ [Option ID = 25052]

Correct Answer :-

- $p = 1 \text{ or } p = -\frac{1}{3}$ [Option ID = 25050]

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33) Let $z = x + iy$ be a complex number where x and y are integers. Then the area of the rectangle whose vertices are the roots of the equation $(\bar{z})z^3 + z(\bar{z})^3 = 350$ is

[Question ID = 24957]

1. 32 [Option ID = 39824]
2. 48 [Option ID = 39823]
3. 80 [Option ID = 39826]
4. 40 [Option ID = 39825]

Correct Answer :-

- 48 [Option ID = 39823]

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34) If $z = x + iy$ is a complex number with rationals x and y and $|z| = 1$, then $|z^{2n} - 1|$ is $(n \in N, i = \sqrt{-1})$

[Question ID = 13779]

1. An irrational number [Option ID = 25113]
2. A rational number [Option ID = 25114]
3. Non terminating nor recurring [Option ID = 25115]
4. A positive number [Option ID = 25116]

Correct Answer :-

- A rational number [Option ID = 25114]

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35) A rectangle with one side lying along X-axis is to be inscribed in the closed region of the XY-plane bounded by the lines $y = 0, y = 3x$ and $y = 30 - 2x$. If M is the largest area of such a rectangle, then the value of $\frac{2M}{27}$ is

[Question ID = 25896]

1. 6 [Option ID = 43579]
2. 5 [Option ID = 43580]
3. 1 [Option ID = 43582]
4. 4 [Option ID = 43581]

Correct Answer :-

- 5 [Option ID = 43580]

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36) For every integer n, let a_n and b_n be real numbers. A function $f: R \to R$ is given by

$$f(n) = \begin{cases} a_n + \sin \pi x & \text{for } x \in [2n, 2n+1] \\ b_n + \cos \pi x & \text{for } x \in (2n-1, 2n) \end{cases}$$

for all integers n. If $f(n)$ is continuous, then which of the following holds for all n

[Question ID = 25893]

1. $a_{n-1} - b_{n-1} = 0$ [Option ID = 43567]
2. $a_{n-1} - b_n = -1$ [Option ID = 43570]
3. $a_n - b_{n+1} = 1$ [Option ID = 43569]
4. $a_n - b_n = -1$ [Option ID = 43568]

Correct Answer :-

- $a_{n-1} - b_n = -1$ [Option ID = 43570]

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37)

If $lim_{x\to\infty}\{\sqrt{(x^2-x+1)}-ax-b\}=0$, then b is equal to

[Question ID = 25894]

1. -1/3 [Option ID = 43572]
2. 1/4 [Option ID = 43574]
3. 1/2 [Option ID = 43573]
4. -1/2 [Option ID = 43571]

Correct Answer :-

- -1/2 [Option ID = 43571]

38)

Let z_k, $k=1,2,3,4$ be four complex numbers such that $|z_k|=\sqrt{k+1}$ and $|30z_1+20z_2+15z_3+12z_4|=k|z_2z_3z_4+z_3z_4z_1+z_1z_2z_4+z_1z_2z_3|$. Then k is equal to

[Question ID = 36451]

1. |z1 z3 z4| [Option ID = 55801]
2. |z1 z2 z3| [Option ID = 55802]
3. |z1 z2 z4| [Option ID = 55799]
4. |z3 z2 z4| [Option ID = 55800]

Correct Answer :-

- |z1 z2 z4| [Option ID = 55799]

39) The numbers 1, 2, 3,..., n are arranged in a random order. The probability that the digits 1, 2, 3, ... , *k (k < n)* appears as neighbors in that order, is

[Question ID = 13748]

1. $\frac{(n-k+1)!}{n!}$ [Option ID = 24992]
2. $\frac{1}{n!}$ [Option ID = 24989]
3. $\frac{(n-k)!}{n!}$ [Option ID = 24991]
4. $\frac{k!}{n!}$ [Option ID = 24990]

Correct Answer :-

- $\frac{(n-k+1)!}{n!}$ [Option ID = 24992]

Topic:- DU_J19_BTECH_T3

1)

Paragraph for Questions Let V_r denote the sum of the first r terms of an A.P. whose first term is r and common difference is $(2r-1)$.Let

$$T_r=V_{r+1}-V_r-2 \text{ and } Q_r=T_{r+1}-T_r \text{ for } r=1,2,\ldots$$

Which one of the following statement is a correct?

[Question ID = 13783]

1. $Q_1,Q_2,Q_3,\ldots$ are in A.P. with common difference 6 [Option ID = 25130]
2. $Q_1=Q_2=Q_3=\ldots$ [Option ID = 25132]
3. $Q_1,Q_2,Q_3,\ldots$ are in A.P. with common difference 5 [Option ID = 25129]
4. $Q_1,Q_2,Q_3,\ldots$ are in A.P. with common difference 11 [Option ID = 25131]

Correct Answer :-

- $Q_1, Q_2, Q_3, \ldots$ are in A.P. with common difference 6 [Option ID = 25130]

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2)

Paragraph for Questions Let V_r denote the sum of the first r terms of an A.P. whose first term is r and common difference is $(2r-1)$. Let

$$T_r = V_{r+1} - V_r - 2 \text{ and } Q_r = T_{r+1} - T_r \text{ for } r = 1, 2, \ldots$$

The sum $V_1 + V_2 + \ldots + V_n$ is

[Question ID = 13781]

1. $\frac{n(n+1)(3n^2+n+2)}{12}$ [Option ID = 25122]
2. $\frac{n(n+1)(3n^2-n+1)}{12}$ [Option ID = 25121]
3. $\frac{n(2n^2-n+1)}{12}$ [Option ID = 25123]
4. $\frac{(2n^2-2n+3)}{3}$ [Option ID = 25124]

Correct Answer :-

- $\frac{n(n+1)(3n^2+n+2)}{12}$ [Option ID = 25122]

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3)

Paragraph for Questions Let V_r denote the sum of the first r terms of an A.P. whose first term is r and common difference is $(2r-1)$. Let

$$T_r = V_{r+1} - V_r - 2 \text{ and } Q_r = T_{r+1} - T_r \text{ for } r = 1, 2, \ldots$$

T_r is always

[Question ID = 13782]

1. A prime number [Option ID = 25127]
2. A composite number [Option ID = 25128]
3. An even number [Option ID = 25126]
4. An odd number [Option ID = 25125]

Correct Answer :-

- A composite number [Option ID = 25128]

Topic:- DU_J19_BTECH_T4

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1)

For all non-negative integers x and y, if

$$f(x, y) = f(x-1, f(x, y-1))$$
$$f(0, y) = y + 1$$
$$f(x+1, 0) = f(x, 1),$$

then the value of $f(1, 2)$ is

[Question ID = 13786]

1. 2 [Option ID = 25142]
2. 1 [Option ID = 25144]
3. 3 [Option ID = 25143]
4. 4 [Option ID = 25141]

Correct Answer :-

- 4 [Option ID = 25141]

---

2) The minimum value of $f(x) = x^x$ for $x > 0$, is (approximated to 1 decimal place)

[Question ID = 13795]

1. 0.5 [Option ID = 25179]
2. 1 [Option ID = 25177]
3. 0.7 [Option ID = 25178]
4. 0.2 [Option ID = 25180]

Correct Answer :-

- 0.7 [Option ID = 25178]

---

3) A function $f(x)$ is defined as

$$f(x) = \begin{cases} \text{integer closet to } x, & x \neq 0.5, x \neq 1.5 \\ 1, & x = 0.5 \\ 2, & x = 1.5 \end{cases}$$

The area under the graph for $0 \leq x \leq 2$ is

[Question ID = 13792]

1. 2 [Option ID = 25165]
2. 1 [Option ID = 25168]
3. 3 [Option ID = 25167]
4. 4 [Option ID = 25166]

Correct Answer :-

- 2 [Option ID = 25165]

---

4)

$$\text{If } I = \int_1^2 \left(\cot^{-1}\sqrt{x-1}\right) dx \text{ , then the value of } I \text{ is}$$

[Question ID = 13787]

1. 2 [Option ID = 25146]
2. 1/2 [Option ID = 25148]
3. 1 [Option ID = 25147]
4. 4 [Option ID = 25145]

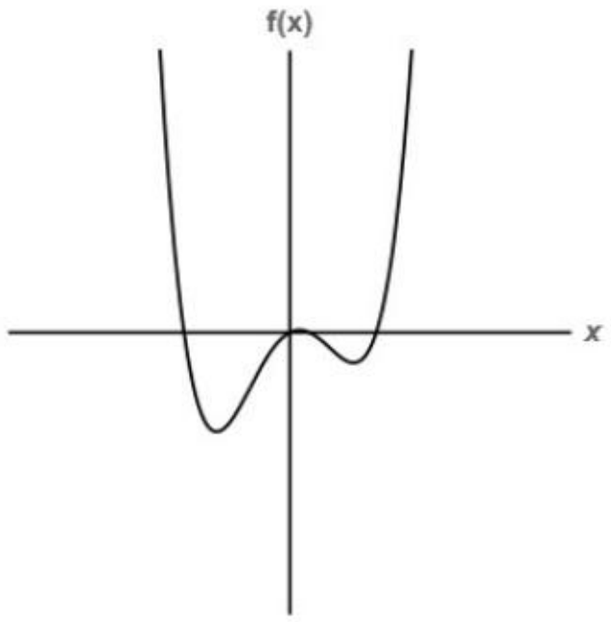
Correct Answer :-

- 1 [Option ID = 25147]

---

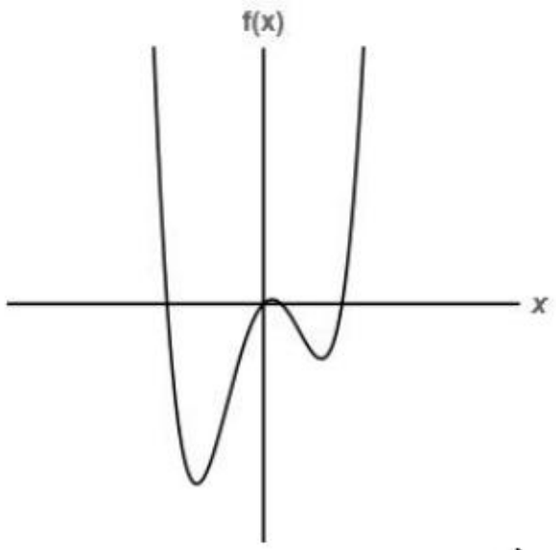
5)

The graph of a function $y = f(x)$ is given as

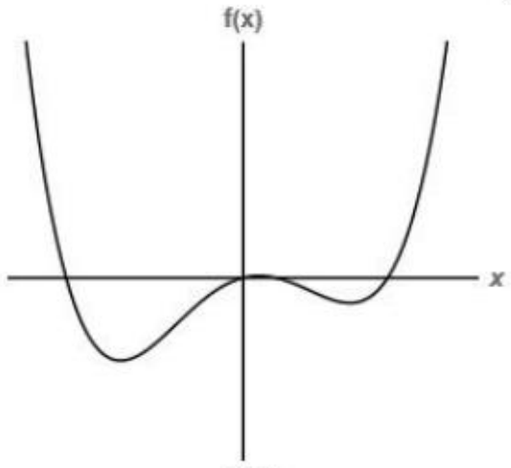


The graph of $y = f(4x)$ can be

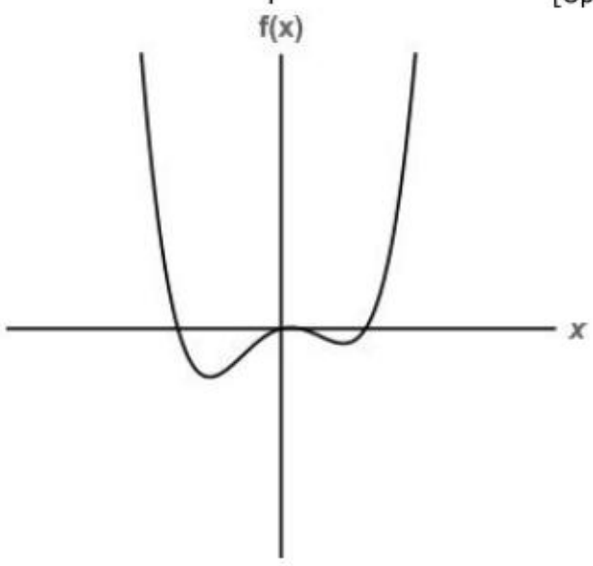
[Question ID = 13789]

1. 

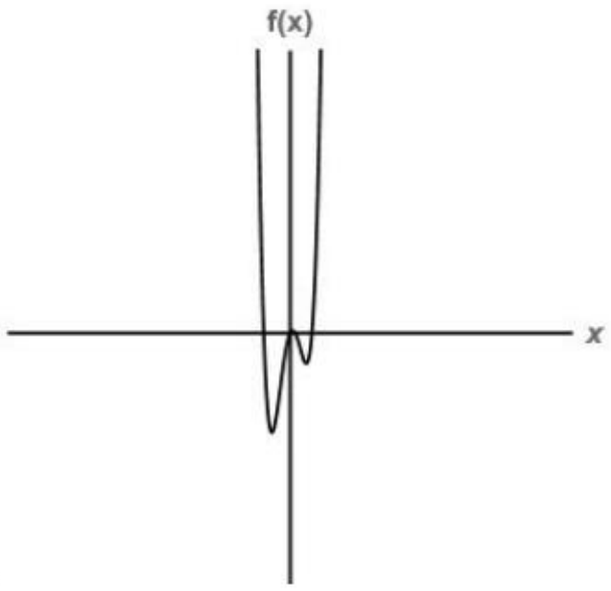
[Option ID = 25153]

2. 

[Option ID = 25155]

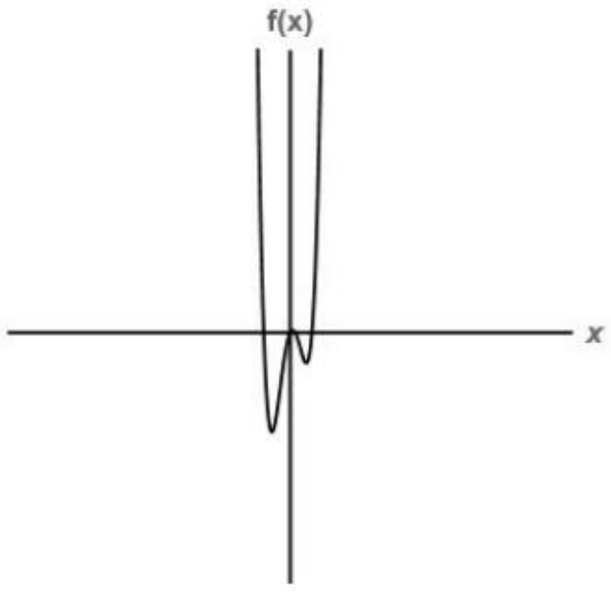
3. 

[Option ID = 25154]



4. [Option ID = 25156]

Correct Answer :-



- [Option ID = 25156]

6) If $x \in (0, \pi/2)$, and $\cos x = 1/3$, then $\sum_{m=0}^{\infty} \frac{\cos mx}{3^m} =$

[Question ID = 13788]

1. 2 [Option ID = 25150]
2. 0 [Option ID = 25151]
3. 1 [Option ID = 25149]
4. 3 [Option ID = 25152]

Correct Answer :-

- 1 [Option ID = 25149]

7) $\frac{\int_0^{\pi/2} \sin^{102} x\, dx}{\int_0^{\pi/2} \sin^{100} x\, dx} =$

[Question ID = 13793]

1. $\frac{100}{102}$ [Option ID = 25171]
2. $\frac{204}{203}$ [Option ID = 25169]
3. $\frac{101}{102}$ [Option ID = 25172]
4. $\frac{102}{100}$ [Option ID = 25170]

Correct Answer :-

- $\frac{101}{102}$ [Option ID = 25172]

8)

Three functions $f(x)$, $g(x)$ and $H(x)$ are defined as follows:

$$f''(x) = -f(x)$$

$$g(x) = f'(x)$$

$$H(x) = \left(f\left(\frac{x}{2}\right)\right)^2 + \left(g\left(\frac{x}{2}\right)\right)^2$$

If $H(e) = \pi$, then $H(\pi) =$

[Question ID = 25075]

1. 0 [Option ID = 40297]
2. π [Option ID = 40295]
3. 1 [Option ID = 40298]
4. e [Option ID = 40296]

Correct Answer :-

- π [Option ID = 40295]

---

9) If $\log_{0.4}(x-1) < \log_{0.16}(x-1)$, then x lies in the interval

[Question ID = 13785]

1. [2, ∞) [Option ID = 25137]
2. (0, 1) ∪ (2, ∞) [Option ID = 25138]
3. (1, ∞) [Option ID = 25140]
4. (2, ∞) [Option ID = 25139]

Correct Answer :-

- (2, ∞) [Option ID = 25139]

---

10) The minimum value of $3\tan^2 A + 12\cot^2 A =$

[Question ID = 13790]

1. 6 [Option ID = 25160]
2. 15 [Option ID = 25157]
3. 9 [Option ID = 25158]
4. 12 [Option ID = 25159]

Correct Answer :-

- 12 [Option ID = 25159]

---

11) Let $f:(1,\infty) \to R$ be a continuous function such that

$$\int_2^{150} \left((x-1)\left(\ln(x-1)\right)\left(2f(x) - (x-1)\ln(x-1)\right)dx\right) = \int_2^{150} (f(x))^2\,dx$$

The value of $f(101)$ is

[Question ID = 25076]

1. 101 ln (101) [Option ID = 40301]
2. 149 ln (149) [Option ID = 40302]
3. 100 ln (100) [Option ID = 40299]
4. 148 ln (148) [Option ID = 40300]

Correct Answer :-

- 100 ln (100) [Option ID = 40299]

---

12) $\int_{1331}^{1728} \frac{dx}{x - x^{1/3}} =$

[Question ID = 13791]

1. $\frac{12}{11}\ln\frac{144}{121}$ [Option ID = 25163]
2. $\frac{11}{12}\ln\frac{144}{121}$ [Option ID = 25162]

3. $\frac{1}{2}\ln\frac{143}{120}$ [Option ID = 25164]
4. $\frac{3}{2}\ln\frac{143}{120}$ [Option ID = 25161]

Correct Answer :-

- $\frac{3}{2}\ln\frac{143}{120}$ [Option ID = 25161]

Topic:- DU_J19_BTECH_T5

1) Directions for questions Consider the equation

$$x^2 + 4xy + 4y^2 + 3x + 6y - 18 = 0$$

The area enclosed by the curve $x^2 + 4xy + 4y^2 + 3x + 6y - 18 = 0$ on the interval $-1 \le x \le 1$ is

[Question ID = 13799]

1. 6 [Option ID = 25196]
2. 18 [Option ID = 25193]
3. 9 [Option ID = 25195]
4. 4 [Option ID = 25194]

Correct Answer :-

- 9 [Option ID = 25195]

2) Directions for questions Consider the equation

$$x^2 + 4xy + 4y^2 + 3x + 6y - 18 = 0$$

The equation represents [Question ID = 13798]

1. An ellipse [Option ID = 25190]
2. A parabola [Option ID = 25189]
3. A pair of straight lines [Option ID = 25192]
4. A hyperbola [Option ID = 25191]

Correct Answer :-

- A pair of straight lines [Option ID = 25192]

Topic:- DU_J19_BTECH_T6

1) A Ferris wheel with a radius of 10 m is rotating at a rate of one revolution every 2 minutes. How fast is a rider rising when his seat is 16 m above the lowest point of the Ferris wheel? [Question ID = 25180]

1. 32π m/ min [Option ID = 40717]
2. 8π m/ min [Option ID = 40715]
3. 16π m/ min [Option ID = 40716]
4. 40π m/ min [Option ID = 40718]

Correct Answer :-

- 8π m/ min [Option ID = 40715]

2)

A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 1 m higher than the bow of the boat. If the rope is pulled in at a rate of 1 m/s, how fast is the boat approaching the dock when it is 8 m from the dock?

[Question ID = 13809]

1. 1 m/sec [Option ID = 25233]
2. 2.2 m/ sec [Option ID = 25234]
3. $\frac{8}{\sqrt{65}}$ m/sec [Option ID = 25235]
4. $\frac{\sqrt{65}}{8}$ m/sec [Option ID = 25236]

Correct Answer :-

- $\frac{\sqrt{65}}{8}$ m/sec [Option ID = 25236]

---

3) $\int_0^{\pi/3} \frac{\cos 2x - \cos 2\alpha}{\sin x - \sin \alpha} d\alpha =$

[Question ID = 13801]

1. $-1+\frac{2\pi}{3}\cos x$ [Option ID = 25202]
2. $-1-\frac{\pi}{3}\cos x$ [Option ID = 25201]
3. $-1-\frac{2\pi}{3}\sin x$ [Option ID = 25204]
4. $1+\frac{2\pi}{3}\sin x$ [Option ID = 25203]

Correct Answer :-

- $-1-\frac{2\pi}{3}\sin x$ [Option ID = 25204]

---

4)

A curve $y = f(x)$ satisfies the differential equation $\frac{d^2y}{dx^2} = \sqrt{1-\left(\frac{dy}{dx}\right)^2}$ and the tangent to the curve at the origin is inclined at an angle of 45° with the positive direction of the $x-$axis. The value of y at $x = 90^\circ$ is

[Question ID = 13807]

1. 2 [Option ID = 25227]
2. 0 [Option ID = 25226]
3. 1/2 [Option ID = 25228]
4. 1 [Option ID = 25225]

Correct Answer :-

- 1 [Option ID = 25225]

---

5)

A square is inscribed in a circle with diameter 4 cms. Four smaller circles are then constructed with their diameters on each of the sides of the square. The area of the shaded region is

[Question ID = 26028]

1. 16 sq cms. [Option ID = 44107]
2. 4 π - 8 sq. cms [Option ID = 44110]
3. 8 sq cms. [Option ID = 44108]
4. 2 π - 8 sq. cms. [Option ID = 44109]

Correct Answer :-

- 8 sq cms. [Option ID = 44108]

6) Let $f(x) = (x+1)(x^2+1)(x^4+1)(x^8+1)(x^{16}+1)$. Then $f'(1) =$

[Question ID = 25178]

1. 2^{32} [Option ID = 40708]
2. $2^{31}+2$ [Option ID = 40710]
3. 496 [Option ID = 40709]
4. 16 [Option ID = 40707]

Correct Answer :-

- 496 [Option ID = 40709]

7) If the solution curve of the differential equation $\frac{dy}{dx} = \frac{1+ax}{2y+b}$ is a circle, then the value of a is

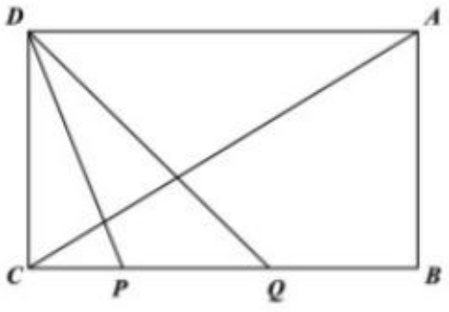
[Question ID = 13806]

1. 2 [Option ID = 25222]
2. -2 [Option ID = 25221]
3. -4 [Option ID = 25224]
4. 4 [Option ID = 25223]

Correct Answer :-

- -2 [Option ID = 25221]

8) In the rectangle $ABCD$, $DC : CP : PQ : QB = 1 : 3 : 1 : 9$.
$\sin \angle PDQ : \sin \angle DAC =$



[Question ID = 13811]

1. 4:3 [Option ID = 25244]
2. 1:1 [Option ID = 25242]
3. 3:2 [Option ID = 25243]
4. 2:1 [Option ID = 25241]

Correct Answer :-

- 1:1 [Option ID = 25242]

9) The area bounded by the curves $x^2 + y^2 = 1$ and $y = |x|$ is

[Question ID = 25179]

1. $\pi/4$ [Option ID = 40713]
2. $\pi/8$ [Option ID = 40712]
3. $\pi/8 + ½$ [Option ID = 40714]
4. $\pi/8 - ½$ [Option ID = 40711]

Correct Answer :-

- $\pi/4$ [Option ID = 40713]

10)

$$\lim_{x \to \infty}\left(\left(x-\sqrt{x^2+x+1}\right)\frac{\ln\left(e^x+x\right)}{x}\right)=$$

[Question ID = 13802]

1. -0.5 [Option ID = 25207]
2. 0.5 [Option ID = 25205]
3. does not exist [Option ID = 25208]
4. 1 [Option ID = 25206]

Correct Answer :-

- -0.5 [Option ID = 25207]

11) A new social media company *Whatstotalk* currently has 10,000 users registered for a subscription price of Rs. 100. The marketing research team has found that for every rupee drop in the subsciption rate there is an increase of 125 in the number of registered users. The subscription rate for maximum revenue must be then [Question ID = 13804]

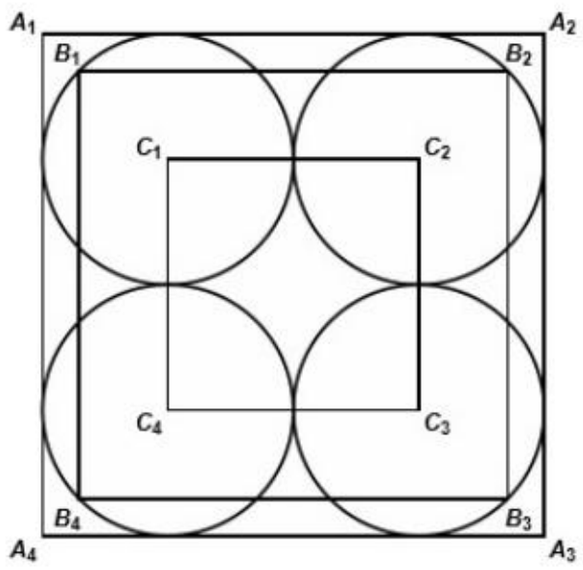
1. Rs 40 [Option ID = 25215]
2. Rs 90 [Option ID = 25213]
3. Rs 75 [Option ID = 25214]
4. Rs 60 [Option ID = 25216]

Correct Answer :-

- Rs 90 [Option ID = 25213]

Topic:- DU_J19_BTECH_T7

1) Directions for Questions : Four congruent circles with centres C_1, C_2, C_3 and C_4 touch each other externally (as shown in the figure). Three squares whose sides are parallel to each other are drawn so that the vertices of the second square B_1, B_2, B_3 and B_4 are on the circles. The sides of the first square are tangent to the circles.



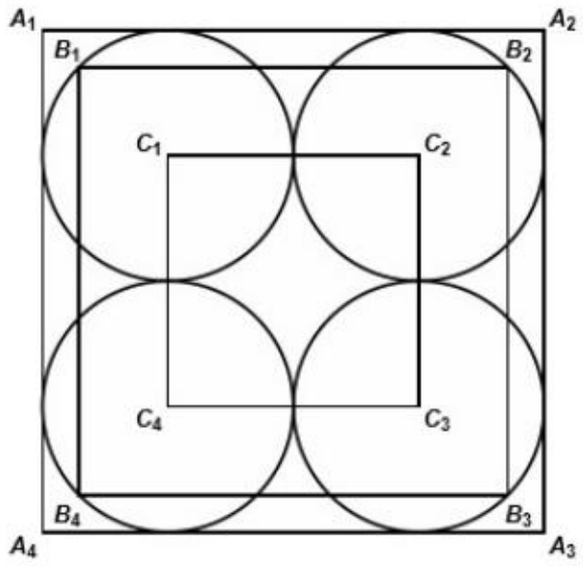
[Question ID = 13814]

1. [Option ID = 25254]
2. [Option ID = 25255]
3. [Option ID = 25256]
4. [Option ID = 25253]

Correct Answer :-

- [Option ID = 25254]

2) **Directions for Questions** : Four congruent circles with centres C_1, C_2, C_3 and C_4 touch each other externally (as shown in the figure). Three squares whose sides are parallel to each other are drawn so that the vertices of the second square B_1, B_2, B_3 and B_4 are on the circles. The sides of the first square are tangent to the circles.



If the side of the largest square is a, of the second square is b and of the smallest square is c, then

[Question ID = 13813]

1. $ac = 4b^2$ [Option ID = 25252]
2. $b\,(a - b) = 2c$ [Option ID = 25249]
3. $2b(a - b) = c^2$ [Option ID = 25251]
4. $ac = b^2$ [Option ID = 25250]

Correct Answer :-

- $2b(a - b) = c^2$ [Option ID = 25251]

3)

[Question ID = 13815]

1. 68 [Option ID = 25260]
2. 90 [Option ID = 25259]
3. 14 [Option ID = 25257]
4. 59 [Option ID = 25258]

Correct Answer :-

- 59 [Option ID = 25258]

Topic:- DU_J19_BTECH_T8

1)

[Question ID = 13818]

1. [Option ID = 25271]
2. [Option ID = 25270]
3. [Option ID = 25269]
4. [Option ID = 25272]

Correct Answer :-

2)

The radius of the inscribed circle is [Question ID = 13817]

1. [Option ID = 25268]
2. [Option ID = 25266]
3. [Option ID = 25267]
4. [Option ID = 25265]

Correct Answer :-

Topic:- DU_J19_BTECH_T9

1) [Question ID = 13826]

1. Part of Niatruc and Nikpan is not in the shaded part. [Option ID = 25304]
2. Part of the shaded region is only in Nikpan. [Option ID = 25302]
3. Part of the shaded region is in Lewot but not in Niatruc. [Option ID = 25301]
4. Part of the shaded region is in Niatruc and Nikpan but not in Lewot. [Option ID = 25303]

Correct Answer :-

2) [Question ID = 13822]

1. [Option ID = 25285]
2. [Option ID = 25288]
3. [Option ID = 25287]
4. [Option ID = 25286]

Correct Answer :-

- [Option ID = 25287]

3) [Question ID = 13825]

1. 22 [Option ID = 25297]
2. 11 [Option ID = 25300]
3. 13 [Option ID = 25299]
4. 17 [Option ID = 25298]

Correct Answer :-

- 13 [Option ID = 25299]

4) [Question ID = 13827]

1. 44 [Option ID = 25308]
2. 42 [Option ID = 25307]
3. 41 [Option ID = 25306]
4. 40 [Option ID = 25305]

Correct Answer :-

- 44 [Option ID = 25308]

5) [Question ID = 13820]

1. Annulus C has the smallest area. [Option ID = 25279]
2. All have equal areas. [Option ID = 25280]
3. Annulus A has the smallest area [Option ID = 25277]
4. Annulus B has the smallest area [Option ID = 25278]

Correct Answer :-

- All have equal areas. [Option ID = 25280]

6) [Question ID = 13823]

1. 3 π- 9 square units [Option ID = 25289]
2. π - 1 square units [Option ID = 25292]
3. 2 π - 4 square units C [Option ID = 25290]
4. 8 π - 9 square units [Option ID = 25291]

Correct Answer :-

- 2 π - 4 square units C [Option ID = 25290]

7) [Question ID = 13821]

1. 13 units [Option ID = 25284]
2. 12 units [Option ID = 25281]
3. 6 units [Option ID = 25282]
4. 10 units [Option ID = 25283]

Correct Answer :-

- 6 units [Option ID = 25282]

8) If the diameter of the bigger circle is 18 units, then the radius of the smaller circle is

[Question ID = 13824]

1. 3 units [Option ID = 25296]
2. 9 units [Option ID = 25294]
3. 6 units [Option ID = 25293]
4. [Option ID = 25295]

Correct Answer :-

- 3 units [Option ID = 25296]

Topic:- DU_J19_BTECH_T10

1) If you can take one or two steps at a time, then the number of ways you can climb a set of 7 stairs is [Question ID = 13833]

1. 22 [Option ID = 25329]
2. 18 [Option ID = 25332]
3. 20 [Option ID = 25331]
4. 21 [Option ID = 25330]

Correct Answer :-

- 21 [Option ID = 25330]

2)

Which of the following statement is true?

[Question ID = 13842]

1. [Option ID = 25367]
2. [Option ID = 25368]
3. [Option ID = 25365]
4. [Option ID = 25366]

Correct Answer :-

- [Option ID = 25365]

3)

$r - u =$

[Question ID = 13840]

1. 1 [Option ID = 25360]
2. 5 [Option ID = 25357]
3. 4 [Option ID = 25358]
4. 2 [Option ID = 25359]

Correct Answer :-

- 4 [Option ID = 25358]

4)

$q^2 + r^2 =$

[Question ID = 13841]

1. 80 [Option ID = 25363]
2. 100 [Option ID = 25364]
3. 60 [Option ID = 25362]
4. 40 [Option ID = 25361]

Correct Answer :-

- 100 [Option ID = 25364]

5)

q + s + u =

[Question ID = 13839]

1. 15 [Option ID = 25354]
2. 3 [Option ID = 25353]
3. 9 [Option ID = 25356]
4. 6 [Option ID = 25355]

Correct Answer :-

- 15 [Option ID = 25354]

Topic:- DU_J19_BTECH_T11

1)
[Question ID = 13848]

1. 2 [Option ID = 25389]
2. 5 [Option ID = 25392]
3. 3 [Option ID = 25390]
4. 4 [Option ID = 25391]

Correct Answer :-

- 2 [Option ID = 25389]

2)

Number of houses covered by Mr Square is [Question ID = 13847]

1. 6 [Option ID = 25388]
2. 12 [Option ID = 25387]
3. 3 [Option ID = 25385]
4. 4 [Option ID = 25386]

Correct Answer :-

- 12 [Option ID = 25387]

3)

Odd number of houses are covered by [Question ID = 13846]

1. Mr. Triangle [Option ID = 25382]
2. Mr Star [Option ID = 25381]
3. Mr. Circle [Option ID = 25384]
4. Mr. Square [Option ID = 25383]

Correct Answer :-

- Mr. Triangle [Option ID = 25382]

4)

The maximum number of houses are covered by [Question ID = 13845]

1. Mr. Triangle [Option ID = 25378]
2. Mr Star [Option ID = 25377]
3. Mr. Circle [Option ID = 25380]
4. Mr. Square [Option ID = 25379]

Correct Answer :-

- Mr. Square [Option ID = 25379]

5)

The person who distributes the pamphlet to the house located at (3, 4) is [Question ID = 13844]

1. Mr. Triangle [Option ID = 25374]
2. Mr Star [Option ID = 25373]
3. Mr. Circle [Option ID = 25376]
4. Mr. Square [Option ID = 25375]

Correct Answer :-

- Mr Star [Option ID = 25373]

Topic:- DU_J19_BTECH_T12

1)

The two camps in the topmost row are located at [Question ID = 13850]

1. (1, 1) and (1, 8) [Option ID = 25400]
2. (1, 1) and (1, 4) [Option ID = 25397]
3. (1, 4) and (1, 8) [Option ID = 25398]
4. (1, 4) and (1, 5). [Option ID = 25399]

Correct Answer :-

- (1, 1) and (1, 8) [Option ID = 25400]

2)

The square patch where there is no camp is [Question ID = 13851]

1. (8, 2) [Option ID = 25404]
2. (3, 8) [Option ID = 25403]
3. (3, 1) [Option ID = 25402]
4. (3, 3) [Option ID = 25401]

Correct Answer :-

- (3, 3) [Option ID = 25401]

3)

The total number of camps in the two main diagonals of the forest area are [Question ID = 13853]

1. 2 [Option ID = 25410]
2. 1 [Option ID = 25409]
3. 3 [Option ID = 25411]
4. 4 [Option ID = 25412]

Correct Answer :-

- 3 [Option ID = 25411]

4)

The camp associated with the tree in (3, 2) is at [Question ID = 13852]

1. (4, 2) [Option ID = 25408]
2. (2, 2) [Option ID = 25406]
3. (3, 3) [Option ID = 25407]
4. (3, 1) [Option ID = 25405]

Correct Answer :-

- (3, 1) [Option ID = 25405]

Topic:- DU_J19_BTECH_T13

1)

The number 1264 occurs in which column from the left? [Question ID = 13856]

1. Sixth column [Option ID = 25421]
2. Second column [Option ID = 25423]
3. Fifth column [Option ID = 25422]
4. Fourth column [Option ID = 25424]

Correct Answer :-

- Fourth column [Option ID = 25424]

2)

The row that has a blank space in its fourth column from the left is [Question ID = 13857]

1. 272 [Option ID = 25427]
2. 270 [Option ID = 25425]
3. 273 [Option ID = 25428]
4. 271 [Option ID = 25426]

Correct Answer :-

- 270 [Option ID = 25425]

3)

After how many numbers does the pattern repeat itself? [Question ID = 13855]

1. 36 [Option ID = 25419]
2. 42 [Option ID = 25420]
3. 84 [Option ID = 25418]
4. 78 [Option ID = 25417]

Correct Answer :-

- 84 [Option ID = 25418]