Assignment-11

AI24BTECH11036- Shreedhanvi Yadlapally

I. Questions with one mark each

1) If '→' denotes increasing order of intensity, then the meaning of the words [walk → jog → sprint] is analogous to [bothered → _____ → daunted]. Which one of the given options is appropriate to fill the blank? 2024-XE

a) phased
b) phrased
c) fazed
d) fused

2) Two wizards try to create a spell using all the four elements, *water, air, fire, and earth*. For this, they decide to mix all these elements in all possible orders. They also decide to work independently. After trying all possible combination of elements, they conclude that the spell does not work.
How many attempts does each wizard make before coming to this conclusion, independently? 2024-XE

a) 24
b) 48
c) 16
d) 12

3) In an engineering college of 10,000 students, 1,500 like neither their core branches nor other branches. The number of students who like their core branches is 1/4 th of the number of students who like other branches. The number of students who like both their core and other branches is 500.
The number of students who like their core branches is 2024-XE

a) 1,800
b) 3,500
c) 1,600
d) 1,500

4) For positive non-zero variables x and y, if

$$\ln\left(\frac{x+y}{2}\right) = \frac{1}{2}\left\{\ln(x) + \ln(y)\right\}$$

then, the value of $\frac{x}{y} + \frac{y}{x}$ is 2024-XE

a) 1
b) $\frac{1}{2}$
c) 2
d) 4

5) In the sequence 6, 9, 14, x, 30, 41, a possible value of x is 2024-XE

a) 25
b) 21
c) 18
d) 20

II. Questions with two marks each

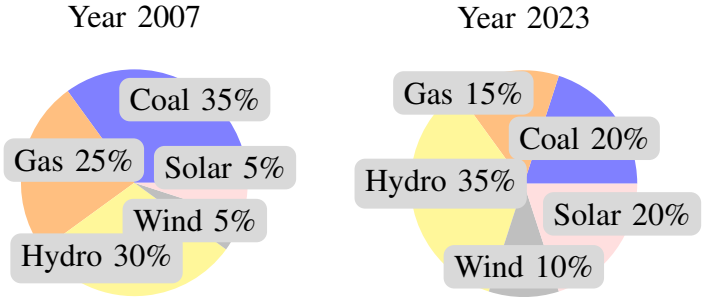
1) Sequence the following sentences in a coherent passage.
P: This fortuitous geological event generated a colossal amount of energy and heat that resulted in the rocks rising to an average height of 4 km across the contact zone.
Q: Thus, the geophysicists tend to think of the Himalayas as an active geological event rather than as a static geological feature.
R: The natural process of the cooling of this massive edifice absorbed large quantities of atmospheric carbon dioxide, altering the earth's atmosphere and making it better suited for life.
S: Many millennia ago, a breakaway chunk of bedrock from the Antarctic Plate collided with the massive Eurasian Plate. 2024-XE

a) QSPR
b) QPSR
c) SPQR
d) SRPQ

2) A person sold two different items at the same price. He made 10% profit in one item, and 10% loss in the other item. In selling these two items, the person made a total of 2024-XE

a) 1% profit
b) 2% profit
c) 1% loss
d) 2% loss

3) The pie charts depict the shares of various power generation technologies in the total electricity generation of a country for the years 2007 and 2023.
The renewable sources of electricity generation consist of Hydro, Solar and Wind. Assuming that



the total electricity generated remains the same from 2007 to 2023, what is the percentage increase in the share of the renewable sources of electricity generation over this period? 2024-XE

a) 25%
b) 50%
c) 77.5%
d) 62.5%

4) A cube is to be cut into 8 pieces of equal size and shape. Here, each cut should be straight and it should not stop till it reaches the other end of the cube.
The minimum number of such cuts required is 2024-XE

a) 3
b) 4
c) 7
d) 8

5) In the 4×4 array shown below, each cell of the first three rows has either a cross ($\times$) or a number
The number in a cell represents the count of the immediate neighboring cells (left, right, top, bottom,

1	×	4	3
×	5	5	4
3	×	6	×

diagonals) NOT having a cross (×). Given that the last row has no crosses (×), the sum of the four numbers to be filled in the last row is 2024-XE

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

III. XE-A Questions with one mark each

1) Let

$$f(x) = \begin{cases} \pi + x, & -\pi \leq x < 0, \\ 0, & 0 \leq x < \pi, \end{cases}$$

with $f(x + 2\pi) = f(x)$. If $F(x)$ represents the fourier series of $f(x)$, then the value of $F\left(-\frac{\pi}{2}\right) + F(0)$ is 2024-XE

a) 0
b) $\frac{\pi}{2}$
c) π
d) $\frac{3\pi}{2}$

2) Let y be a non-zero quadratic polynomial satisfying the differential equation

$$\left(2 + x^2\right)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - ky = 0,$$

where k is a real constant. If $y(1) = 1$, then the value of the integral

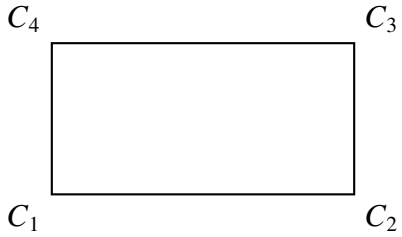
$$\int_0^1 2ydx$$

is 2024-XE

a) $\frac{1}{3}$
b) $\frac{2}{3}$
c) 1
d) $\frac{4}{3}$

3) There are four cities namely, C_1, C_2, C_3 and C_4. The cities are directly connected by four roads as shown in the picture given below, that is, C_1 is connected with C_2, C_2 is coonected with C_3, C_3 is connected with C_4, and C_4 is connected with C_1. The probability of getting any road independently is $\frac{1}{3}$. Let E_1 be the event of travelling from C_1 to C_3 via C_2 and E_2 be the event of traveling from C_1 to C_3 via C_4. The, which of the following statements is correct? 2024-XE

a) $P(E_1 \cup E_2) = \frac{56}{81}$
b) $P(E_1 \cup E_2) = \frac{8}{9}$
c) $P(E_1|E_2) \neq P(E_1) = \frac{4}{9}$
d) $P(E_1 \cap E_2) = 0$



4) Assume that $f : \{0, 1\} \to \mathbb{R}$ is continuous on $[0, 1]$ and differentiable on $(0, 1)$ such that $f(x + h) = f(x) + hf'(x + \theta h)$ for some $0 < \theta < 1$. If $f(x) = x^2(1 + x)$, and θ is expressed in terms of x and h, then the value of

$$\lim_{h \to 0} \theta(x, h)$$

is 2024-XE

a) $\frac{1}{3}$
b) $\frac{1}{2}$
c) $\frac{1}{4}$
d) $\frac{4}{5}$

5) Let A be a 3×3 matrix whose eigenvalues are 2, 3, 4 and let I be the identity matrix of order 3. If

$$A^{-1} = \frac{1}{2k}\left(A^2 - A\right) + \frac{13}{k}I$$

for some integer $k \neq 0$, then the value of k is _____ 2024-XE

6) For some integer k, the differential equation

$$x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + (k + 2)y - 0$$

is transformed into $(D - 2)^2 y = 0$, where $D = \frac{d}{dt}$ and $t = \log_e x$. Then, the value of k is _____ 2024-XE

7) The approximate value (*rounded off to two decimal places*) of the integral

$$\int_0^{1/2} e^{-x^2} dx,$$

using the Trapezoidal rule with step-size $h = \frac{1}{8}$, is _____ 2024-XE

IV. Questions with two marks each

1) Consider $f(z) = e^z$, where $z = x + iy$ and $i = \sqrt{-1}$. Which of the following statemnets is correct? 2024-XE

a) f is periodic
b) f is not periodic
c) $|f| = 1$
d) $\arg(f) = y \pm n\pi$ for all $n = 0, 1, 2 \ldots$

2) Let P and Qbe two square matrices of the same order. Then, which of the following matrices is/are necessarily equal tp $(P + 2Q)^2$? 2024-XE

a) $P^2 + 4PQ + 4Q^2$
b) $P(P + 2Q) + Q(2P + Q)$
c) $(P + 2Q)(2Q + P)$
d) $P^2 + 2PQ + 2QP + 4Q^2$

3) If

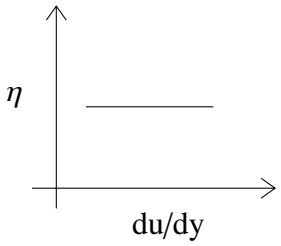
$$\int_0^{\alpha} \int_{\sqrt{x/\alpha}}^{1} e^{y^3} dy dx = e - 1,\ \alpha > 0,$$

then the value (*in integer*) of α is _____ 2024-XE

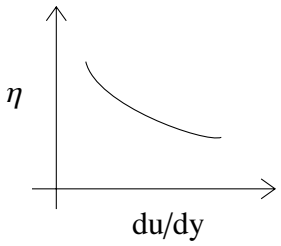
4) Consider the vector field $\mathbf{F} = \left(2x + y^2\right)\hat{i} + (2xy + 3y)\,\hat{j}$ and $\alpha_m = \int_{C_m} \mathbf{F} \cdot \mathbf{dr}$, $m = 1, 2$, where C_1 is an arc of the unit circle connecting the points $(1, 0)$ and $(0, 1)$ and C_2 is the straight line connecting the points $(1, 0)$ and $(0, 1)$. The the value (*in integer*) of $2\left(\alpha_1^2 + 3\alpha_2^2\right)$ is _____ 2024-XE

V. XE-B Questions with one mark each

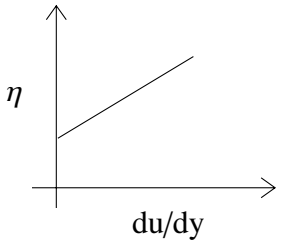
1) Which one of the following figures shows the CORRECT dependence of apparent viscosity (η) on the rate of shear strain(du/dy) for pseudoplastic fluids? 2024-XE



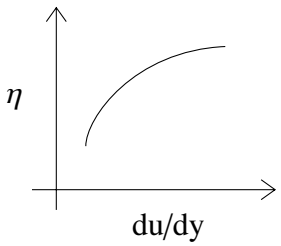
a)



b)



c)



d)

2) The locus of temporary locations of all particles that have passed through a fixed point in the flow field at a particular instant is known as 2024-XE
   a) streamline.
   b) streakline.
   c) pathline.
   d) timeline.
3) Consider the velocities u, v, and w in $x-$, $y-$ and $z-$directions, respectively. The vortocity expression in the $y-z$ plane is 2024-XE
   a) $\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}$
   b) $\frac{\partial v}{\partial y} - \frac{\partial w}{\partial z}$
   c) $\frac{\partial w}{\partial y} - \frac{\partial v}{\partial z}$
   d) $\frac{\partial u}{\partial z} - \frac{\partial w}{\partial x}$
4) For the laminar, incompressible flow over a flat plate with uniform free stream velocity, the axial pressure gradient within the boundary layer is 2024-XE
   a) greater than zero.
   b) less than zero.
   c) equal to zero.
   d) equal to the axial velocity gradient.
5) Let $\mathbf{r}, \mathbf{V}$ and m be position vector, velocity vector, and mass, respectively in a control mass system. Which one of the following properties is considered as conserved extensive property in Reynolds Transport Theorem to obtain the angular momentum equation? 2024-XE
   a) $\mathbf{r} \times m\mathbf{V}$
   b) $\mathbf{r} \times \mathbf{V}$
   c) $m\mathbf{V}$
   d) m