

# 2021-July

## Session-20-07-2021-shift-2-16-30

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- 21) Consider a triangle having vertices **A**  $(-2, 3)$ , **B**  $(1, 9)$ , **C**  $(3, 8)$ . if a line L passing through the circumcentre of triangle ABC, bisects the line BC, and intersects the Y-axis at  $\left(0, \frac{\alpha}{2}\right)$ , then the value of real number  $\alpha$  is
- 22) Let  $\{a_n\}_{n=1}^{\infty}$  be a sequence such that  $a_1 = 1, a_2 = 1$  and  $a_{n+2} = 2a_{n+1} + a_n$  for all  $n \geq 1$ . Then the value of  $47 \sum_{n=1}^{\infty} \frac{a_n}{2^{3n}}$  is equal to  $\dots$
- 23) The number of solutions of the equation

$$\log_{x+1} (2x^2 + 7x + 5) + \log_{2x+5} (x+1)^2 - 4 = 0$$

where  $x > 0$  is

- 24) If  $\lim_{x \rightarrow 0} \frac{\alpha x e^x - \beta \log_e^{1+x} + \gamma x^2 e^{-x}}{x \sin^2 x} = 10, \alpha, \beta, \gamma \in \mathbf{R}$ , then the value of  $\alpha + \beta + \gamma$  is
- 25) For  $p > 0$ , a vector  $\mathbf{v}_2 = 2\hat{i} + (p+1)\hat{j}$  is obtained by rotating the vector  $\mathbf{v}_1 = \sqrt{3}p\hat{i} + \hat{j}$  by an angle  $\theta$  about the origin in a counter clock wise direction if  $\tan \theta = \frac{\alpha\sqrt{3}-2}{4\sqrt{3}+3}$ , then the value of  $\alpha$  is
- 26) Let  $A = \{a_{ij}\}$  be a  $3 \times 3$  matrix, where

$$a_{ij} = \begin{cases} (-1)^{j-i} & \text{if } i < j, \\ 2 & \text{if } i = j, \\ (-1)^{i+j} & \text{if } i > j, \end{cases}$$

Then  $\det(3Adj(2A^{-1}))$  is equal to

- 27) Let a curve  $y = y(x)$  be given by solution of the differential equation

$$\cos\left(\frac{1}{2} \cos^{-1}(e^x)\right) dx = \sqrt{e^{2x} - 1} dy$$

if it intersects y-axis at  $y = -1$ , and the intersection point of the curve with x-axis is  $(\alpha, 0)$ , then  $e^\alpha$  is equal to

- 28) Let a function  $g: [0, 4] \rightarrow \mathbf{R}$  be defined as

$$g(x) = \begin{cases} \max_{0 \leq t \leq x} \{t^3 - 6t^2 + 9t - 3\}, & 0 \leq x \leq 3 \\ 4 - x, & 3 < x \leq 4 \end{cases}$$

then the number of points in the interval  $(0, 4)$  where  $g(x)$  is NOT differentiable, is

- 29) For  $k \in \mathbf{N}$ , let

$$\frac{1}{\alpha(\alpha+1)(\alpha+2) \cdots (\alpha+20)} = \sum_{k=0}^{20} \frac{A_k}{\alpha+k}$$

where  $\alpha > 0$  then the value of  $100 \left( \frac{A_{14} + A_{15}}{A_{13}} \right)^2$  is equal to

- 30) If the point on the curve  $y^2 = 6x$ , nearest to the point  $\left(3, \frac{3}{2}\right)$  is  $(\alpha, \beta)$ , then the value of  $2(\alpha + \beta)$  is