

- 16) The solution curve of the differential equation,  $(1 + e^{-x})(1 + y^2) \frac{dx}{dy} = y^2$ , which passes through the point  $(0, 1)$ , is
- $y^2 = 1 + y \log_e \left( \frac{1+e^{-x}}{2} \right)$
  - $y^2 + 1 = y \left( \log_e \left( \frac{1+e^{-x}}{2} \right) + 2 \right)$
  - $y^2 + 1 = y \left( \log_e \left( \frac{1+e^x}{2} \right) + 2 \right)$
  - $y^2 = 1 + y \log_e \left( \frac{1+e^x}{2} \right)$
- 17) The area in (insq.units) of the region  $\{(x, y) : 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, \frac{1}{2} \leq x \leq 2\}$  is:
- $\frac{23}{16}$
  - $\frac{19}{16}$
  - $\frac{23}{24}$
  - $\frac{19}{24}$
- 18) If  $\alpha$  and  $\beta$  are the roots of the equation  $x^2 + px + 2 = 0$  and  $\frac{1}{\alpha}$  and  $\frac{1}{\beta}$  are the roots of the equation  $2x^2 + 2qx + 1 = 0$ , then  $\left(\alpha - \frac{1}{\alpha}\right)\left(\beta - \frac{1}{\beta}\right)\left(\alpha + \frac{1}{\beta}\right)\left(\beta + \frac{1}{\alpha}\right)$  is equal to:
- $\frac{9}{4} (9 + p^2)$
  - $\frac{9}{4} (9 + q^2)$
  - $\frac{9}{4} (9 - p^2)$
  - $\frac{9}{4} (9 - q^2)$
- 19) The lines  $\vec{r} = (\hat{i} - \hat{j}) + l(2\hat{i} + \hat{k})$  and  $\vec{r} = (2\hat{i} - \hat{j}) + m(\hat{i} + \hat{j} + \hat{k})$
- do not intersect for any values of  $l$  and  $m$
  - intersect when  $l = 1$  and  $m = 2$
  - intersect when  $l = 2$  and  $m = \frac{1}{2}$
  - intersect for all values of  $l$  and  $m$
- 20) Let  $[t]$  denote the greatest integer  $\leq t$ . If for some  $\lambda \in R - \{0, 1\}$ ,  $\lim_{x \rightarrow 0} \left| \frac{1-x+|x|}{\lambda-x+[x]} \right| = L$ , then  $L$  is equal to:
- 0
  - 2
  - $\frac{1}{2}$
  - 1
- 21) If  $\lim_{x \rightarrow 0} \left\{ \frac{1}{x^8} \left( 1 - \cos \frac{x^2}{2} - \cos \frac{x^2}{4} + \cos \frac{x^2}{2} \cos \frac{x^2}{4} \right) \right\} = 2^{-k}$ , then the value of  $k$  is ...
- 22) The diameter of the circle, whose centre lies on the line  $x + y = 2$  in the first quadrant and which touches both the lines  $x = 3$  and  $y = 2$ , is ...
- 23) The value of  $(0.16)^{\log_{2.5} \left( \frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \dots \right)}$  is equal to ...
- 24) Let  $A = \begin{pmatrix} x & 1 \\ 1 & 0 \end{pmatrix}$ ,  $x \in R$  and  $A^4 = [a_{ij}]$ . If  $a_{11} = 109$ , then  $a_{22}$  is equal to ...

- 25) If  $\left(\frac{1+i}{1-i}\right)^{m/2} = \left(\frac{1+i}{i-1}\right)^{n/3} = 1, (m, n \in \mathbb{N})$  then the greatest common divisor of the least values of  $m$  and  $n$  is ...