(ii) $x^2 \dfrac{\partial^2 f}{\partial x^2} + 2xy \dfrac{\partial^2 f}{\partial x \, \partial y} + y^2 \dfrac{\partial^2 f}{\partial y^2}$
$= n(n-1)f$ 20

(c) Find the vertices of the skew quadrilateral formed by the four generators of the hyperboloid

$$\frac{x^2}{4} + y^2 - z^2 = 49$$

passing through (10, 5, 1) and (14, 2, − 2). 20

Section—B

5. Attempt any *five* of the following :

(a) Consider the differential equation

$$y' = \alpha x, \quad x > 0$$

where α is a constant. Show that—

(i) if $\phi(x)$ is any solution and $\psi(x) = \phi(x) e^{-\alpha x}$, then $\psi(x)$ is a constant;

(ii) if $\alpha < 0$, then every solution tends to zero as $x \rightarrow \infty$. 12

(b) Show that the differential equation

$$(3y^2 - x) + 2y(y^2 - 3x)y' = 0$$

admits an integrating factor which is a function of $(x + y^2)$. Hence solve the equation. 12