4(a) Apply the method of variation of parameters to solve
\[ \frac{d^2y}{dx^2} + 4y = \tan 2x \] (10)

(b) Solve \[ x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 5y = x^2 \sin (\log x) \] (10)

**SECTION-B**

5(a) Apply convolution theorem to evaluate: \[ L^{-1}\left[ \frac{s^2}{(s^2+4)^2} \right] \] (10)

(b) Find \[ L^{-1}\left[ \log \frac{s(s+1)}{s^2+4} \right] \] (10)

6(a) Evaluate \[ \iint r^3 \, dr \, d\theta \] over the area included between the circles \[ r = 2 \sin \theta , r = 4 \sin \theta . \] (10)

(b) Change into polar co-ordinate and evaluate \[ \int_0^\infty \int_0^\infty e^{-(x^2+y^2)} \, dy \, dx . \] (10)

7(a) Find the area enclosed by the ellipse \[ \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 . \] (10)

(b) Find by double integration, the area lying inside the circle \( r = a \sin \theta \) and outside the cardioid (10)