7. (a) Use the Trapezoidal and the Simpson's rules with eleven ordinates to find approximate value of $\int_0^1 \frac{dx}{2+2x^2}$. Compare your results with exact value of the integral and hence state which rule is more correct. (Give your answers correct to four decimal places).

(b) Derive the Secant formula.

(c) The equation $x^3 - 3x - 20 = 0$ has a single real root inside the interval $[3, 4]$. Approximate the root in four iterations using the secant formula obtained.

(10 marks)

8. (a) (i) Given that θ_1 and θ_2 are the angles that lines L_1 and L_2 make with the x – axis respectively, derive the formula to find the angle between L_1 and L_2 where $\theta_1 > \theta_2$.

(ii) Use the formula obtained in part (a) (i) to find the acute angle between $4x - 3y - 5 = 0$ and $2x + y - 1 = 0$.

(b) Find the perpendicular distance of the point $(6, 8)$ from the line $y = 3 - \frac{5}{4}x$.

(c) A point P moves so that it is equidistant from the points A(1, 2) and $B(-2, -1)$. Find the cartesian equation of the locus of P.

(10 marks)

9. (a) Evaluate $\int \frac{3\,dx}{15 + 9\cos x}$.

(b) Evaluate $\int_0^{\frac{\sqrt{2}}{2}} \frac{x \sin^{-1} x^2}{\sqrt{1 - x^4}} dx$.

(c) Find the length of the arc of the parabola $y = x^2$ from $x = 0$ to $x = 1$.

(10 marks)

10. (a) Differentiate $x^2 \cos^{-1}\left(\frac{x}{2}\right)$ with respect to x.

(b) Find $\frac{dy}{dx}$ if $y = \frac{e^{2x} \ln x}{(x-1)^3}$.

(c) Use Maclaurin's theorem to expand $\ln(2 + x)$ in ascending powers of x as far as the term in x^5.

(10 marks)