B.N. Bandodkar College of Science, Thane

Second Term end Examination March 2012

S.Y.B.Sc

Mathematics

Paper-III

Duration 2 hrs **Max Marks-60**

N.B. 1) **All Questions are compulsory.**

2) **Figures to right indicate full marks.**

Q.1 **a)** Find the area of the region enclosed by parabola $y = 2 - x^2$ and the line $y = -x$. **3**

b) **Attempt any three of the following.**

(i) What is Descarte's rule of signs? How many positive real roots the polynomial $p(x)$ has?
Where $p(x) = 5x^5 - 3x^4 + 6x^2 - 2x - 26$. **4**

(ii) Derive the formula for Euler's method for solving first order differential equation. **4**

(iii) Find the average value of $f(x) = x^2 - 2x$ over the interval $[0, 3]$. **4**

(iv) Find the iteration function $\emptyset(x)$ for the equation $x^2 - 5 = 0$ which converge to the root using fixed point iteration method. **4**

(v) Define order and degree of the differential equation. Find order and degree of the given differential equation $(y'')^5 + 65y = x^4$. **4**

Q.2 **a)** Define Improper integral. State whether the given integral is improper integral of first kind or second kind. **3**

$$\int_6^9 \frac{1}{x-7}\,dx.$$

b) **Attempt any three of the following.**

(i) Check for the convergence of the improper integral **4**

$$I = \int_0^\infty \frac{1}{1+x^2}\,dx.$$

(ii) State Limit form of Comparison test and Direct Comparison test. **4**

(iii) Prove that $(n+1) = n!$. **4**

(iv) Prove that $\int_{-\infty}^{\infty} x^{2n-1} e^{-ax^2}\,dx = \frac{\Gamma(n)}{2a^n}$. **4**

P.T.O.

(v) Derive the formula for finding the area of the region bounded by curves $y = f(x)$ and $y = g(x)$ and by the lines $x = a$ and $x = b$ where f and g are continuous function with $f(x) \geq g(x) \ \forall \ x \in [a, b]$. **4**

Q.3 **a)** Derive Newton-Raphson formula using Taylor series. **7**

b) **Attempt any two of the following.**

(i) Discuss the convergence of Newton –Raphson method **4**

(ii) Discuss the convergence of fixed point iteration method. **4**

(iii) Explain the bisection method. **4**

(iv) Decompose the given matrix into LU decomposition using Do-little method. **4**

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$$

Q.4 **a)** Derive the formula for second order Runge-Kutta method. **7**

b) **Attempt any two of the following.**

(i) Write the formula for Milne-Simpson method. **4**

(ii) Explain Taylor's series method for solving first order differential equation. **4**

(iii) Write the formula for fourth order Runge-Kutta method **4**

(iv) Explain Picard's method for solving the ordinary differential equation. **4**

****