**B.N.BANDODKAR COLLEGE OF SCIENCE – THANE**

**S.Y.B.Sc Second Term Examination March – 2012**

**Mathematics**

**Paper I**

**Duration – 2 Hrs** **Max. Marks 60**

**N.B. All questions are compulsory.**

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| **Q.1** | **(a)** | Find the general solution of $y'' - 5y' + 6y=0$. | **(3)** |
| | **(b)** | **Attempt any three of the following.** | |
| | **(i)** | Solve: $( 3x^2 + 4xy ) dx + ( 2x^2 + 2y ) dy = 0$ . | **(4)** |
| | **(ii)** | Find the Centre of Mass of a thin plate bounded by $x = y^2$ and $x = 2y$ . | **(4)** |
| | **(iii)** | Evaluate $\iint(x+2y)dxdy$ where D is the region bounded by $y = x^2$ and $y = 1$ . | **(4)** |
| | **(iv)** | Find the volume of the tetrahedron bounded by the planes Y = 0, z = 0,x = 0 & x + y + z = 1. | **(4)** |
| | **(v)** | Find the potential function $\Phi$ for f ( x, y ) = $(2x\cos y, -x^2 \sin y)$. | **(4)** |
| **Q.2** | **(a)** | Solve : $\cos (x + y ) dy = dx$. | **(3)** |
| | **(b)** | **Attempt any three of the following.** | |
| | **(i)** | Prove that the substitution y = zx converts the Homogeneous differential equation M dx + Ndy = 0 into variable separable form. | **(4)** |
| | **(ii)** | Solve : $y'' + 3y' – 10y = 0$. | **(4)** |
| | **(iii)** | Find the general solution of $y'' – y' – 6y = 20 e^{-2x}$. | **(4)** |
| | **(iv)** | If $y_1 = x$ is a solution of $x^2y'' + xy' – y = 0$ then find the general solution. | **(4)** |
| | **(v)** | Find the particular solution of $y'' + y = \operatorname{cosec} x$. | **(4)** |
| **Q.3** | **(a)** | Find the volume of the region bounded by the planes x + y + z = 1 , x = 0 , y = 0, z = 0. | **(3)** |
| | **(b)** | **Attempt any three of the following.** | |
| | **(i)** | Find moment of Inertia of a thin plate bounded by the parabola $x = y – y^2$ and the line x + y = 0. | **(4)** |
| | **(ii)** | Find the area of the triangle having vertices ( 0, 0 ), ( 1, 1 ), ( 0, 1 ). | **(4)** |
| | **(iii)** | Evaluate $\iint_D x^2y^2dxdy$ over the region D = { ( x, y ) $\mid x^2 + y^2 \leq 1$}. | **(4)** |
| | **(iv)** | Find the average value of f ( x, y ) = x cos y over the region bounded by y = 0, $y = x^2$, x = 1. | **(4)** |
| | **(v)** | Evaluate $\iiint_D 2xydzdydx$ over the region bounded by x = 0, x = 1, y = x, y = 2x, z = 0 , z = x + y. | **(4)** |

**Q.4** **(a)** Evaluate the line integral of f(x, y) = (x, y) over the curve C : $y = x^2$ from ( -1, 1) to (1, 1). **(3)**

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

**(i)** Use line integral to find area of the Ellipse $x^2 / a^2 + y^2 / b^2 = 1$. **(4)**

**(ii)** Find the potential function of F(x, y) = $(3 + 2xy, x^2 – 3y^2)$. **(4)**

**(iii)** Evaluate $\int_c x^4 dx + xydy$ , where c is the triangular area having vertices ( 0,0 ), ( 1, 0 ), ( 0, 1 ). **(4)**

**(iv)** Find the work done of f(x, y) = $(x^2,y^2)$ over the upper half of the circle $x^2 + y^2 = 1$. **(4)**

**(v)** Find the flux density of F ( x, y ) = $( 3x^3y^4,4xy^2 )$. **(4)**

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