**Paper / Subject Code: N10521 / Applied Mathematics - II**

(Time: 2 hours)                                             Max Marks: 60

Note:  1.  Question No. 1 is Compulsory.
　　　　2.  Attempt any 3 Questions from the remaining questions.
　　　　3.  Scientific Calculator is allowed to use

| Que. 1 | | Attempt **any Five** questions. | |
|---|---|---|---|
| | a. | Solve $(x - 2e^y)dy + (y + x\,sinx)dx = 0$ | 3 |
| | b. | Using Euler's method find approximate value of y when $\frac{dy}{dx} = x^2 + y^2$; and $y(0) = 1$ at $x = 0.6$ take $h = 0.2$. | 3 |
| | c. | Evaluate: $\int_0^2 \int_0^z \int_0^{yz} xyz\ dxdydz$ . | 3 |
| | d. | Evaluate Gamma function $\int_0^\infty x^2 e^{-x^8}\ dx$ . | 3 |
| | e. | Evaluate: $\int_0^1 \int_0^x e^{x+y}\ dydx$ . | 3 |
| | f. | Solve $(\frac{d^4y}{dx^4} + 2\frac{d^2y}{dx^2} + y) = 0$ | 3 |

| Que. 2 | a. | Solve $\frac{dy}{dx} = x + y$ with $x_0 = 0, y_0 = 1$ by Euler's modified method for $x = 0.05$ correct to three places of decimals.(take h = 0.05) | 4 |
|---|---|---|---|
| | b. | Show that $\int_0^{2a} x^2 \sqrt{2ax - x^2}\ dx = \frac{5}{8}a^4\pi$ . | 5 |
| | c. | Use method of variation of parameters to solve the differential equation $(D^2 - 2D + 2)y = e^x \tan x$ . | 6 |

| Que. 3 | a. | Evaluate $\int_0^\pi \int_0^{a\,sin\theta} r\,drd\theta$ . | 4 |
|---|---|---|---|
| | b. | Solve the differential equation $(x^2 + y^2 + 1)dx - 2xydy = 0$ | 5 |
| | c. | Solve $\frac{dy}{dx} = \frac{1}{x+y}$, $x_0 = 0, y_0 = 1$ for the interval (0,1) choosing h=0.5 by Runge–Kutta method of 4th Order (up to 3 decimal places). | 6 |

| Que. 4 | a. | Solve $(D^3 + D)y = x^2$ | 4 |
|---|---|---|---|
| | b. | Find the mass of the lamina bounded by the curves $ay^2 = x^3$ and the line $by = x$ if the density at a point varies as the distance of the point from the x-axis. | 5 |
| | c. | Solve $\frac{dy}{dx} = 2y(1 - 2xy)$ | 6 |

| Que. 5 | a. | Prove that $\int_0^\infty \frac{\log(1+ax^2)}{x^2}\ dx = \pi\sqrt{a},\,(\,a > 0\,)$ . | 4 |
|---|---|---|---|
| | b. | Find the area of the cardioid $r = a(1 + cos\theta)$ by double integration. | 5 |
| | c. | Evaluate by changing into polar coordinates $\int_0^a \int_y^a \frac{x^2}{\sqrt{x^2+y^2}}\ dxdy$ . | 6 |

| Que. 6 | a. | Change the order of integration $\int_0^1 \int_0^{\sqrt{1-y^2}} f(x, y)dxdy$ . | 4 |
|---|---|---|---|
| | b. | Solve the differential equation $(D^2 - 3D + 2)y = e^{2x}x^2$ | 5 |
| | c. | Evaluate $\int_0^1 \frac{x^2}{1+x^3} dx$ by using Trapezoidal rule and Simpson's (1/3)$^{rd}$ rule.(choose h = 0.25) | 6 |

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