

Time: 2 Hours

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 of the following
- Solve $(\tan y + x)dx + (x \sec^2 y - 3y)dy = 0$. 3
 - Using Euler's method find approximate value of y for $x = 0.06$ given $\frac{dy}{dx} = x - y^2$; $y(0) = 1$ take $h = 0.02$. 3
 - Evaluate: $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} (x + y + z) dy dx dz$ 3
 - Evaluate $\int_0^{\infty} x e^{-x^4} dx$ 3
 - Evaluate: $\int_0^1 \int_0^x (x^2 + y^2) x dy dx$. 3
 - Solve $(\frac{d^3 y}{dx^3} - 5 \frac{d^2 y}{dx^2} + 8 \frac{dy}{dx} - 4y) = 0$ 3
- Que. 2
- Solve $\frac{dy}{dx} = x + 3y$ with $x_0 = 0, y_0 = 1$ by Euler's modified method for $x = 0.05$ correct to three places of decimals. (in one step) 4
 - Evaluate $\int_0^{\pi/6} \sin^2 6x \cos^3 3x dx$. 5
 - Use method of variation of parameters to solve the differential equation $(D^2 + 3D + 2)y = e^{e^x}$ 6
- Que. 3
- Evaluate $\int_0^{\pi} \int_0^{a(1+\cos\theta)} r dr d\theta$. 4
 - Solve the differential equation $(x^4 + y^4)dx - xy^3 dy = 0$ 5
 - Solve $\frac{dy}{dx} = x^3 + y$, $x = 0, y = 2$ by Runge-kutta method of 4th order for $x = 0.2$. 6
- Que. 4
- Solve $(D^2 + 4)y = x^2 + 1$ 4
 - Find the mass of the lamina bounded by the curves $y^2 = x$ and $x^2 = y$ if the density of the lamina at any point varies as the square of its distance from origin. 5
 - Solve $x \frac{dy}{dx} + y = x^3 y^6$ 6
- Que. 5
- Prove that $\int_0^1 \frac{x^{\alpha-1}}{\log x} dx = \log(1 + \alpha), \alpha \geq 0$. 4
 - Find by double integration the area inside the circle $r = a \sin \theta$ and outside the cardioid $r = a(1 - \cos \theta)$. 5
 - Evaluate by changing into polar coordinates $\int_0^1 \int_x^{\sqrt{2x-x^2}} (x^2 + y^2) dy dx$ 6
- Que. 6
- Solve the differential equation $(D^2 - 4D + 4)y = e^{2x} \sin 2x$ 4
 - Change the order of integration $\int_0^1 \int_0^{\sqrt{1-x^2}} f(x, y) dy dx$. 5
 - Find the approximate value of $\int_0^6 e^x dx$ by using
(1) Trapezoidal Rule
(2) Simpson's (1/3)rd rule 6
