Paper / Subject Code: 10521 / Applied Mathematics - II

FE Sem - II (NEP 2020) Summer 2024-25 14/5/2025.

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

a. Solve $(\tan y + x)dx + (x\,sec^2 y - 3y)dy = 0$ 3

b. 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

c. Evaluate: $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dydxdz$ 3

d. Evaluate $\int_0^\infty xe^{-x^4}\,dx$ 3

e. Evaluate: $\int_0^1\int_0^x (x^2+y^2)x\,dydx$. 3

f. Solve $(\frac{d^3y}{dx^3} - 5\frac{d^2y}{dx^2} + 8\frac{dy}{dx} - 4y) = 0$ 3

Que. 2 a. 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

b. Evaluate $\int_0^{\pi/6} sin^2 6\,x cos^3 3x dx$. 5

c. Use method of variation of parameters to solve the differential equation $(D^2+3D+2)y = e^{e^x}$ 6

Que. 3 a. Evaluate $\int_0^{\pi}\int_0^{a(1+cos\theta)} r\,drd\theta$. 4

b. Solve the differential equation $(x^4+y^4)dx - xy^3dy = 0$ 5

c. 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 a. Solve $(D^2+4)y = x^2 + 1$ 4

b. 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

c. Solve $x\frac{dy}{dx} + y = x^3y^6$ 6

Que. 5 a. Prove that $\int_0^1 \frac{x^\alpha - 1}{\log x}\,dx = \log(1+\alpha)\,, \alpha \geq 0$. 4

b. Find by double integration the area inside the circle $r = a\sin\theta$ and outside the cardioid $r = a(1 - cos\theta)$. 5

c. Evaluate by changing into polar coordinates $\int_0^1\int_x^{\sqrt{2x-x^2}}(x^2+y^2)dydx$ 6

Que. 6 a. Solve the differential equation$(D^2 - 4D + 4)y = e^{2x}\sin 2x$ 4

b. Change the order of integration $\int_0^1\int_0^{\sqrt{1-x^2}} f(x,y)dydx$. 5

c. Find the approximate value of $\int_0^6 e^x\,dx$ by using 6

(1)Trapezoidal Rule

(2) Simpson's (1/3)[rd] rule and

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