ub Code: BSCT-201 ROLL NO.................................

SECONDSEMESTER EXAMINATION, 2022 – 23

IInd Year, B.Tech. – CSE/ECE/ME/CE/EE/IT

Mathematics-II

tion: 3:00 hrs **Max Marks: 100**

: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing the same may be assumed and state the assumption made in the answer.

Answer any four parts of the following. a) Find the value of λ for which the differential equation $(xy^2 + \lambda x^2 y)dx + (x+y)x^2 dy = 0$ is exact. b) Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x sinx$. c) Solve by the method of variations of parameters $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = \frac{e^{-x}}{x^2}$. d) Solve $x^2p^2 + xyp - 6y^2 = 0$ e) Solve $xdx + ydy = \frac{a^2(xdy - ydx)}{x^2+y^2}$ f) Solve $\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + (4x^2-1)y = -3e^{x^2}\sin 2x$.	**5x4=20**
Answer any four parts of the following. a) Solve by the method of variation of parameter $\frac{d^2y}{dx^2} + y = Secx$ b) Express the algebraic polynomial $6x^3 + 15x^2 - x + 9$ as Legendre's polynomials. c) Prove that $x\,J_n'(x) = n\,J_n(x) - x\,J_{(n+1)}(x)$ for Bessel's functions. d) Solve $\frac{d^2y}{dx^2} + cotx\frac{dy}{dx} + 4y\, cosec^2x = 0$ by changing the independent variable. e)Solve $(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0$ in series. f)Solve $(x^2y^2 + xy + 1)ydx + (x^2y^2 - xy + 1)xdy = 0$.	**5x4=20**
Answer any two parts of the following. (a) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dydx$ *by changing to polar coordinates* .Hen ce show that $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$. (b) *Evaluate* $\int_0^1 \int_{x^2}^{2-x} xy\, dydx$ *by changing the order of integration*.	**10x2= 20**

	(c) Evaluate $\iint_S \vec{F}.\hat{n}\, dS, where\ \vec{F} = xy\,\hat{\imath} - x^2\hat{\jmath} + (x+z)\hat{k}$ and S is the region of the plane $2x + 2y + z = 6$ in the first octant.	
	Answer any two parts of the following. (a) State and prove Cauchy Riemann equations in Cartesian coordinate system. (b) Prove that the functions $u(x,y) = (x^2 - y^2)$ and $v = \frac{y}{x^2+y^2}$ are harmonic function but not harmonic conjugate. (c) Find the value of $C_1 and C_2\ such\ that\ the\ function\quad f(z) = x^2 + C_1y^2 - 2xy + i(C_2x^2 - y^2 + 2xy)$ is analytic. Also, find $f'(z)$.	**10x2= 20**
	Answer any two parts of the following. (a) (i) Using Cauchy integral formula to calculate $\int_C \frac{4-3z}{z(z-1)(Z-2)} dz$ where C is the circle $\|z\| = \frac{3}{2}$ (ii) Define Poles and Residues. (b) Evaluate the integral $\int_0^{2\pi} \frac{d\theta}{a+bcos\theta}$ using Residue theorem. (c)Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series for (i) $1 < \|z\| < 3$ $(ii)\|z\| > 3$	**10x2= 20**

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