



BRIDGE COURSE

MATDIP301

Third Semester B.E. Degree Examination, April 2023 Advanced Mathematics – I

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Find the modulus and amplitude of the complex number $\frac{4+2i}{2-3i}$. (06 Marks)
- b. Express the complex number $Z = \frac{(3+i)(1-3i)}{2+i}$ in the form of $x + iy$. (06 Marks)
- c. Explain $\sqrt{3} + i$ in polar form and hence find the modulus and amplitude. (08 Marks)
- 2 a. Find the n^{th} derivative of e^{ax} . (06 Marks)
- b. Find the n^{th} derivative of $\cos^2 3x$. (06 Marks)
- c. If $y = e^{m \sin^{-1} x}$, then prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0$. (08 Marks)
- 3 a. Find the angle between the radius vector and the tangent to the curve $r = a(1 + \cos\theta)$. (06 Marks)
- b. Obtain the Maclaurin's series expansion of the function $\sin x$ up to the term containing x^4 . (06 Marks)
- c. With usual notation, prove that $\tan \phi = r \frac{d\theta}{dr}$. (08 Marks)
- 4 a. If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x + y}\right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$. (06 Marks)
- b. If $u = \log(x^3 + y^3)$, find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$. (06 Marks)
- c. If $u = x + y$, $v = y + z$, $w = z + x$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$. (08 Marks)
- 5 a. Evaluate $\int_{x=0}^1 \int_{y=x}^{\sqrt{x}} xy dy dx$. (06 Marks)
- b. Evaluate $\int_0^{\pi/6} \sin^6 3x dx$. (06 Marks)
- c. Obtain the reduction formula for $\int \sin^n x dx$, where n is positive integer. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 a. Evaluate $\int_{x=0}^2 \int_{y=1}^3 \int_{z=1}^2 xy^2z \cdot dzdydx$. (06 Marks)
- b. Evaluate $\iint_R xydx dy$, where R is the region in positive Quadrant for which $x + y \leq 1$. (06 Marks)
- c. With usual notations, prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (08 Marks)
- 7 a. Solve: $\sec^2x \tan y dx + \sec^2y \tan x dy = 0$. (06 Marks)
- b. Solve: $(2xy + y - \tan y)dx + (x^2 - x \tan^2y + \sec^2y)dy = 0$. (06 Marks)
- c. Solve: $(2x + y + 1)dx + (x + 2y + 1)dy = 0$. (08 Marks)
- 8 a. Solve: $(D^3 - 6D^2 + 11D - 6)y = 0$. (06 Marks)
- b. Solve: $(D^2 + 6D + 9)y = 0$. (06 Marks)
- c. Solve: $(D^3 - 2D^2 + 4D - 8)y = 0$. (08 Marks)

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