

Code No: 51002

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, October/November - 2020

MATHEMATICS-I

(Common to CE, EEE, ME, ECE, CSE, EIE, IT, ETM, AE, BT, AME, MIE)

Time: 2 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

- 1.a) Test the convergence of the series $\sum \frac{1}{\sqrt{n(n+1)}}$.
- b) Test the convergence of $\sum \frac{x^n}{n^{n-1}}$, ($x > 0$).
- c) Test the following series for absolute and conditional convergence $\sum_1^{\infty} \frac{(-1)^n}{n \log n}$. [5+5+5]
- 2.a) Verify Rolle's theorem for the function $f(x) = e^{-x/2}x(x+3)$ in $(-3,0)$.
- b) Discuss the maximum and minimum is $x^3y^2(1-x-y)$. [7+8]
- 3.a) Find the radius of curvature of $x = \log t$, $y = \frac{1}{2}\left(t + \frac{1}{t}\right)$ at $t=1$
- b) Find the envelope of the family of straight lines $y = mx + \frac{a}{m}$, for different values of m . [7+8]
- 4.a) Find the length of curve cut off by Latus rectum from the parabola $y^2 = 4ax$.
- b) By changing the order of integration evaluate $\int_0^1 \int_{x^2}^{2-x} xy dy dx$. [7+8]
- 5.a) Solve $(y^3 - 2x^2y) dx + (2xy^2 - x^3) dy = 0$.
- b) Find the orthogonal Trajectories of the family of circles $x^2 + y^2 = ax$. [8+7]
- 6.a) Solve the differential equation $(D^3 - 1)y = (e^x + 1)^2$.
- b) Solve $\frac{d^2y}{dx^2} + y = \sec x$ by the method of variation of Parameters. [7+8]
- 7.a) Find the Laplace transform of $f(t) = (t^2 + t + 3)\cos 2t$.
- b) Find $L^{-1}\left[\frac{s+2}{s^2-4s+13}\right]$. [8+7]
8. Verify Green's theorem for $\int_c (xy + y^2) dx + x^2 dy$ where c is bounded by $y = x$ and $y = x^2$. [15]

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