R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, June - 2015
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, BME, IT, MCT, ETM, MMT, ECM, AE, BT, AME, MIE, PTE, CEE, MSNT, AGE)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a) Test the convergence of the following series $\sum u_n = \sum \frac{1}{n} \sin \frac{1}{n}$.

b) Test the convergence of the series $\sum_1^\infty \frac{e^n}{(1+e^{2n})}$.

c) Test whether the following series is absolutely convergent or conditionally convergent $\sum_1^\infty \frac{(-1)^n}{n \log n}$.   [5+5+5]

2.a) Verify Rolle's theorem for the function $f(x) = e^{-x/2} x(x+3)$ in $(-3, 0)$.

b) Find three positive numbers whose sum is 100 and their product is maximum.   [7+8]

3.a) Find the radius of curvature at the origin for the curve $y - x = x^2 + 2xy + y^2$.

b) Find the envelop of the family of curves $\frac{ax}{\cos\alpha} - \frac{by}{\sin\alpha} = a^2 - b^2$, α is a parameter.   [8+7]

4.a) By changing the order of integration evaluate $\int_0^1 \int_{x^2}^{2-x} xy\,dy\,dx$.

b) Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dx\,dy\,dz$.   [7+8]

5.a) Solve the differential equation $x(x-1)\frac{dy}{dx} - y = x^2(x-1)^3$.

b) A bacterial culture, growing exponentially, increases from 100 to 400 grams in 10 hrs. How much was present after 3 hours?   [7+8]

6.a) Solve the differential equation $(D^2 + 9)y = \cos 3x + \sin 2x$.

b) Solve by the method of variation of parameters the differential equation $(D^2 + 4)y = \tan 2x$.   [7+8]

7.a) Find $L\left[\frac{1 - \cos t}{t}\right]$.

b) Solve the differential equation $y'' - 3y' + 2y = 4t + e^{3t}$, $y(0) = y'(0) = 1$ using Laplace transforms.   [7+8]

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]