

R09

Code No: 09A1BS01

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech I Year Examinations, June - 2014

MATHEMATICS-I

(Common to all Branches)

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 series whose  $n^{\text{th}}$  term is  $\sqrt{n+1} - \sqrt{n-1}$ .
- b) Prove that the series  $1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots$  is conditionally convergent.
- 2.a) Expand  $\cos x$  in powers of  $(x - \pi/4)$  up to 4 terms.
- b) If  $f_1 = xy + yz + zx$ ,  $f_2 = x^2 + y^2 + z^2$  and  $f_3 = x + y + z$ . Determine whether they are functionally dependent. If so find the relation.
- 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 center of curvature at  $(a, a)$  on  $a^2 y = x^3$ .
- 4.a) Find the length of the curve  $y^2 = x^3$  from the origin to the point  $(1, 1)$ .
- b) Evaluate  $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dx dy$  by change of order of integration.
- 5.a) Solve the differential equation  $x \log x \frac{dy}{dx} + y = 2 \log x$ .
- b) Bacteria in a culture grows exponentially so that the initial number has doubled in 3 hours. How many times, the initial number will be present after 9 hours.
- 6.a) Solve the differential equation  $(D^2 + 1)y = \sin x \sin 2x$ .
- b) Solve by method of variation of parameters  $\frac{d^2 y}{dx^2} + y = \operatorname{cosec} x$ .
7. Solve the differential equation  $\frac{d^2 y}{dt^2} + \frac{2dy}{dt} + 5y = e^t \sin t$  where  $y(0) = 0$ ,  $y'(0) = 1$  using Laplace transforms.
8. Verify Stoke's theorem for  $\vec{F} = y^2 \mathbf{i} + y \mathbf{j} - z \mathbf{k}$  and S is the upper half of the sphere  $x^2 + y^2 + z^2 = a^2$  and  $z \geq 0$ .

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