

Code No: C0306

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I Semester Examinations March/April-2011

BASIC ENGINEERING MATHEMATICS

(BIOTECHNOLOGY)

Time: 3hours

Max.Marks:60

Answer any five questions

All questions carry equal marks

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1. a) Prove that  $\sin^4 \frac{\pi}{8} + \sin^4 \frac{3\pi}{8} + \sin^4 \frac{5\pi}{8} + \sin^4 \frac{7\pi}{8} = \frac{3}{2}$ .
- b) Prove that  $\left(1 + \cos \frac{\pi}{8}\right) \left(1 + \cos \frac{3\pi}{8}\right) \left(1 + \cos \frac{5\pi}{8}\right) \left(1 + \cos \frac{7\pi}{8}\right) = \frac{1}{8}$ . [12]
2. a) If A, B, C are angles of a triangle, prove that  $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$
- b) If  $A+B+C = 90^\circ$  then prove that  $\sin^2 A + \sin^2 B + \sin^2 C = 1 - 2 \sin A \sin B \sin C$ . [12]
3. a) Compute  $\lim_{x \rightarrow 0} \left( \frac{x}{\sqrt{1+x} - \sqrt{1-x}} \right)$ .
- b) Find the derivative of  $\sin 2x$  from the definition. [12]
4. a) If  $x^y = y^x$  then prove that  $\frac{dy}{dx} = \frac{y(x \log y - y)}{x(y \log x - x)}$ .
- b) Find the equation of tangent and normal to the curve  $xy = 10$  at  $(2, 5)$ . [12]
5. a) Evaluate  $\int \left( \frac{x^6 - 1}{x^2 + 1} \right) dx$ .
- b) Evaluate  $\int \cos^4 x dx$ . [12]
6. a) Evaluate  $\int \frac{(x-2)dx}{(x^2 - 4x + 5)}$ .
- b) Find  $\int \frac{(2x+3)dx}{x^2 + x + 1}$ . [12]
7. a) Find  $\int \sin^{-1} \left( \frac{2x}{1+x^2} \right) dx$ .
- b) Find  $\int_0^\pi \frac{\sin^3 x dx}{1 + \cos^2 x}$ . [12]
8. a) Find the solution of differential equation  $\frac{dy}{dx} = (x+y)^2$ .
- b) Find the solution of the differential equation  $\frac{dy}{dx} = \frac{xy}{x^2 + y^2}$ . [12]

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