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Third Semester B.E. Degree Examination, June 2012

Advanced Mathematics – I

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Express $z = \frac{2 - \sqrt{3}i}{1 + i}$ in the form $a + ib$. (06 Marks)
- b. Find modulus and amplitude of $z = \frac{3 + i}{2 + i}$. (07 Marks)
- c. Find all the values of $z = \left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{3/4}$. (07 Marks)
- 2 a. Find the n^{th} derivative of $y = e^{ax} \cos(bx + c)$. (06 Marks)
- b. If $y = \sin(m \sin^{-1} x)$ prove that $(1 - x^2)y_{n+2} - (2n + 1)x y_{n+1} + (m^2 - n^2)y_n = 0$. (07 Marks)
- c. Expand $y = \log(1 + x)$ in Maclaurins series upto 5^{th} term. (07 Marks)
- 3 a. If $u = \frac{x^2 y^2}{x + y}$, find the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2}$. (06 Marks)
- b. If $u = 3x^2 + y^2$ and $x^2 - y^2 = 1$, find $\frac{du}{dx}$. (07 Marks)
- c. If $x = r \cos \phi$, $y = r \sin \phi$, $z = z$, find $\frac{\partial(x, y, z)}{\partial(r, \phi, z)}$. (07 Marks)
- 4 a. Obtain the reduction formula for $\int_0^{\pi/2} \sin^n x \, dx$ and hence obtain $\int_0^{\pi/2} \sin^4 x \, dx$. (06 Marks)
- b. Evaluate $\int_0^1 x^2 (1 - x^2)^{7/2} dx$. (07 Marks)
- c. Evaluate $\int_0^1 \int_0^3 x^3 y^3 dx \, dy$. (07 Marks)
- 5 a. Evaluate $\int_0^1 \int_0^2 \int_0^3 (x + y + z) dz \, dy \, dx$. (06 Marks)
- b. Evaluate $\int_0^\infty x^2 e^{-4x} dx$ using gamma function. (07 Marks)
- c. Find $\beta\left(\frac{5}{2}, \frac{3}{2}\right)$ in terms of gamma function.. (07 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. Solve the equation $\sqrt{1-y^2} dx + \sqrt{1-x^2} dy = 0$. (06 Marks)
- b. Solve $\frac{dy}{dx} = \frac{x-y}{x+y}$. (07 Marks)
- c. Solve $\frac{dy}{dx} = (x+y)^2$. (07 Marks)
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- 7** a. Solve $\frac{dy}{dx} = \frac{\sin 2x - \tan y}{x \sec^2 y}$. (06 Marks)
- b. Solve $\frac{d^2y}{dx^2} + x^2y = x^2$. (07 Marks)
- c. Solve $\frac{dy}{dx} + \sin xy = \sin x \cos x$. (07 Marks)
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- 8** a. Solve $(D^2 + a^2)y = x^2$. (06 Marks)
- b. Solve $(D^3 + D^2 - D - 1)y = e^{2x}$. (07 Marks)
- c. Solve $(D^4 - 1)y = \sin x + 2$. (07 Marks)

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