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MATDIP301

Third Semester B.E. Degree Examination, June/July 2015
Advanced Mathematics – I

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1** a. Express the complex number $\frac{(5-3i)(2+i)}{4+2i}$ in the form $x + iy$. (06 Marks)
- b. Find the modulus and the amplitude of $1 + \cos\theta + i \sin\theta$. (07 Marks)
- c. Find the cube roots of $1 + i$. (07 Marks)
- 2** a. Find the n^{th} derivative of $e^{ax} \cos(bx + c)$. (06 Marks)
- b. Find the n^{th} derivative of $\frac{x}{(x+1)(2x+3)}$. (07 Marks)
- c. If $x = \tan(\log y)$ prove that $(1+x^2)y_{n+1} + (2nx-1)y_n + n(n-1)y_{n-1} = 0$. (07 Marks)
- 3** a. Find the angle of intersection of the curves $r^n = a^n \cos n\theta$, $r^n = b^n \sin n\theta$. (06 Marks)
- b. Find the Pedal equation of the curve $r = a(1 - \cos\theta)$. (07 Marks)
- c. Using Maclaurin's series expand $\log(1+x)$ upto the term containing x^4 . (07 Marks)
- 4** a. If $u = f(x+ct) + g(x-ct)$ show that $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$. (06 Marks)
- b. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ prove that $xu_x + yu_y + zu_z = 0$. (07 Marks)
- c. If $u = x + y$, $v = y + z$, $w = z + x$ find the value of $\frac{\partial(u, v, w)}{\partial(x, y, z)}$. (07 Marks)
- 5** a. Obtain the reduction formula for $\int \cos^n x dx$ where n is a positive integer. (06 Marks)
- b. Evaluate $\int_0^a \frac{x^4}{\sqrt{a^2 - x^2}} dx$. (07 Marks)
- c. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$. (07 Marks)
- 6** a. Define beta and gamma functions and prove that $\Gamma(n+1) = n\Gamma(n)$. (06 Marks)
- b. Show that $\int_0^{\pi/2} \sqrt{\sin\theta} d\theta \times \int_0^{\pi/2} \frac{1}{\sqrt{\sin\theta}} d\theta = \pi$. (07 Marks)
- c. Prove that $\beta(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (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.

- 7 a. Solve : $\frac{dy}{dx} = \cos(x + y + 1)$. (06 Marks)
 b. Solve : $(x^2 - y^2) dx - xydy = 0$. (07 Marks)
 c. Solve : $\frac{dy}{dx} + y \cot x = 4x \operatorname{cosec} x$. (07 Marks)
- 8 a. Solve : $(D^3 - 6D^2 + 11D - 6) y = 0$. (06 Marks)
 b. Solve : $(D^2 + 2D + 1) = x^2 + e^{7x}$. (07 Marks)
 c. Solve : $(D^2 + D + 1)y = \sin 2x$. (07 Marks)

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