



CBCS SCHEME

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15MATDIP31

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018 Additional Mathematics – I

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Express complex numbers $\frac{(5-3i)(2+i)}{4+2i}$ in the form $a+ib$. (06 Marks)
- b. If $x = \cos\theta + i \sin\theta$, then show that $\frac{x^{2n}-1}{x^{2n}+1} = i \tan\theta$ (05 Marks)
- c. Prove that the area of the triangle whose vertices are A, B, C is $\frac{1}{2}[B \times C + C \times A + A \times B]$. (05 Marks)

OR

- 2 a. Find the cube root of $\sqrt{3+i}$. (06 Marks)
- b. Find the modulus and amplitude of $\frac{3+i}{2+i}$ (05 Marks)
- c. Prove that the vectors $i-2j+3k$, $-2i+3j-4k$ and $i-3j+5k$ are coplanar. (05 Marks)

Module-2

- 3 a. Find the n^{th} derivative of $e^{ax} \sin(bx+c)$. (06 Marks)
- b. If $y = e^{a \sin^{-1} x}$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$ (05 Marks)
- c. If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$. (05 Marks)

OR

- 4 a. Find the pedal equation $r = a(1 + \cos\theta)$. (06 Marks)
- b. Expand $\tan x$ in ascending powers of x . (05 Marks)
- c. If $u = x+y+z$, $v = y+z$, $w = z$ then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ (05 Marks)

Module-3

- 5 a. Evaluate $\int_0^{\pi/2} \sin^n x \, dx$. (06 Marks)
- b. Evaluate $\int_0^a \frac{x^3}{\sqrt{a^2-x^2}} \, dx$. (05 Marks)
- c. Evaluate $\int_1^2 \int_1^3 xy^2 \, dx \, dy$ (05 Marks)



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OR

- 6 a. Evaluate $\int_0^1 \int_0^2 \int_0^2 x^2 y z \, dx \, dy \, dz$ (06 Marks)
- b. Evaluate $\int_0^{1/6} \cos^4 3x \, dx$. (05 Marks)
- c. Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}} \, dx$. (05 Marks)

Module-4

- 7 a. A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the velocity and acceleration at $t = 1$ in the direction $i - 3j + 2k$. (06 Marks)
- b. Find the unit vector normal to the surface $x^2 - y^2 + z = 2$ at the point $(1, -1, 2)$. (05 Marks)
- c. Show that the vector $f = (2x - 5y)i + (x - y)j + (3x - z)k$ is a solenoidal. (05 Marks)

OR

- 8 a. If $f(x, y, z) = 3x^2y - y^3z^2$ then find $\text{grad } f$ at the point $(1, -2, -1)$. (06 Marks)
- b. Evaluate (i) $\text{div } R$, (ii) $\text{curl } R$, if $R = xi + yj + zk$. (05 Marks)
- c. Find a , if $(axy - z^2)i + (x^2 + 2yz)j + (y^2 - axz)k$ is an irrotational vector. (05 Marks)

Module-5

- 9 a. Solve $(x^2 + y^2)dx + 2xydy = 0$ (06 Marks)
- b. Solve $(e^x + 1)\cos x \, dx + e^y \sin x \, dy = 0$ (05 Marks)
- c. Solve $(1 + xy)ydx + (1 - xy)x dy = 0$ (05 Marks)

OR

- 10 a. Solve $(x \log x) \frac{dy}{dx} + y = 2 \log x$ (06 Marks)
- b. Solve $(x + 2y^3) \frac{dy}{dx} = y$ (05 Marks)
- c. Solve $(1 + e^{xy})dx + e^{xy} \left(1 - \frac{x}{y}\right) dy = 0$ (05 Marks)

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