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 $\dfrac{(5-3i)(2+i)}{4+2i}$ in the form a + ib. **(06 Marks)**

b. If $x = \cos\theta + i\sin\theta$, then show that $\dfrac{x^{2n}-1}{x^{2n}+1} = i\tan\theta$ **(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 $\dfrac{3+i}{2+i}$ **(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 $u = \sin^{-1}\left(\dfrac{x^2+y^2}{x+y}\right)$ prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \tan u$. **(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 $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$ **(05 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi/2}\sin^n x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^a \dfrac{x^3}{\sqrt{a^2-x^2}}\,dx$. **(05 Marks)**

c. Evaluate $\int_1^2\int_1^3 xy^2\,dxdy$ **(05 Marks)**

OR

6 a. Evaluate $\int_0^1\int_0^2\int_1^2 x^2yz\,dx\,dy\,dz$ **(06 Marks)**

b. Evaluate $\int_0^{\pi/6}\cos^4 3x\,dx$. **(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 grad f at the point $(1, -2, -1)$. **(06 Marks)**

b. Evaluate (i) div R, (ii) 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 $(1 + xy)ydx + (1 - xy)xdy = 0$ **(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 $(1 + e^{x/y})dx + e^{x/y}\left(1 - \frac{x}{y}\right)dy = 0$ **(05 Marks)**

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