CBCS SCHEME

USN | | | | | | | | | | |

18MATDIP31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Express the following complex number in the form of $x + iy$: $\dfrac{(3+i)(1+3i)}{1+5i}$ **(06 Marks)**

b. Prove that $\left(\dfrac{\cos\theta + i\sin\theta}{\sin\theta + i\cos\theta}\right)^4 = \cos 8\theta + i\sin 8\theta$. **(07 Marks)**

c. If $\vec{a} = (3,-1,4)$, $\vec{b} = (1,2,3)$ and $\vec{c} = (4,2,-1)$, find $\vec{a}\times(\vec{b}\times\vec{c})$ **(07 Marks)**

OR

2 a. Find the angle between the vectors, $\vec{a} = 5i - j + k$ and $\vec{b} = 2i - 3j + 6k$. **(06 Marks)**

b. Prove that $[\vec{a}\times\vec{b}, \vec{b}\times\vec{c}, \vec{c}\times\vec{a}] = [\vec{a}, \vec{b}, \vec{c}]^2$ **(07 Marks)**

c. Find the fourth roots of $-1+i\sqrt{3}$ and represent them on the argand diagram. **(07 Marks)**

Module-2

3 a. Obtain the Maclaurin's expansion of $\log_e(1+x)$. **(06 Marks)**

b. If $u = \tan^{-1}\left(\dfrac{x^3+y^3}{x+y}\right)$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 2\tan u$. **(07 Marks)**

c. If $u = x(1-y)$, $v = xy$, find $\dfrac{\partial(u,v)}{\partial(x,y)}$ **(07 Marks)**

OR

4 a. Obtain the Maclauvin's series expansion of the function $\log_e \sec x$. **(06 Marks)**

b. If $u = x^2 - 2y$; $v = x + y$ find $\dfrac{\partial(u,v)}{\partial(x,y)}$ **(07 Marks)**

c. If $u = f(x - y, y - z, z - x)$, prove that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$. **(07 Marks)**

Module-3

5 a. Find the velocity and acceleration of a particle moves along the curve, $\vec{r} = e^{-2t}i + 2\cos 5t\,j + 5\sin 2t\,k$ at any time t. **(06 Marks)**

b. Find div $\vec{F}$ and curl $\vec{F}$, where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$. **(07 Marks)**

c. Show that $\vec{F} = (2xy + z^3)i + (x^2 + 2yz)j + (y^2 + 2xz)k$ is conservative force field and find the scalar potential. **(07 Marks)**

OR

6 a. Show that the vector field, F = (3x + 3y + 4z)i + x — 2y + 3zij + (3x + 2y —)1c is solenoidal. **(06 Marks)**

b. Find the directional derivative of = $\frac{xz}{x^2 + y^2}$ at (—1, 1) in the direction of A = $\hat{i}$ — 2$\hat{j}$+ $\hat{k}$. **(07 Marks)**

c. Find the constant 'a' such that the vector field F = 2xy ^{2}z^{2}i + x yz$^-$j+ax'y'zi is irrotational. **(07 Marks)**

Module-4

7 a. Find the reduction formula for 'sin' xdx **(06 Marks)**

b. Evaluate $\int_0^1 \int_0^3 x^3$ y'dxdy. **(07 Marks)**

c. Evaluate $\int_0^3 \int_0^2 \int_0^1$ (x + y + z)dzdxdy **(07 Marks)**

OR

8 a. Evaluate : $\int_0^6 \sin^6(3x)dx$ **(06 Marks)**

b. Evaluate : f xy dydx **(07 Marks)**

c. Evaluate : $\int_0^1 \int_0^{1-x} \int_0^{1-x-y}$ xyzdzdydx **(07 Marks)**

Module-5

9 a. Solve : $\frac{dy}{dx}$ + y cot x = sin x **(06 Marks)**

b. Solve : (2x^s —xy^2 — 2y +3)dx —(x^{2}y + 2x)cly = 0 . **(07 Marks)**

c. Solve : 3x(x +)dy + (x^3 —3xy — 2y^3)dx =0. **(07 Marks)**

OR

10 a. Solve : (5x^4 +3x^{2}y^2 —2xyldx +(2x^{3}y-3x'y^2 —5y1dy =0. **(06 Marks)**

b. Solve : $\frac{dy}{dx}$ + x sin 2y = x^3 cos' y (07 Marks)

c. Solve : [I+ (x + y)tan $\frac{}{dx}$ + I - 0 . (07 Marks)