Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

USN | | | | | | | | | | | **18MATDIP31**

Third Semester B.E.Degree Examination
Additional Mathematics-I

(Common to all Programmes)

Time: 3 Hrs Max.Marks: 100

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

Module-I

1. (a) Show that $(1+\cos\theta+i\sin\theta)^n+(1+\cos\theta-i\sin\theta)^n=2^{n+1}\cos^n(\theta/2)\cos(n\theta/2)$. **(08 Marks)**

(b) Express $\sqrt{8}+4i$ in the polar form and hence find its modulus and amplitude. **(06 Marks)**

(c) Find the argument of $\dfrac{1+\sqrt{3}i}{1-\sqrt{3}i}$. **(06 Marks)**

OR

2. (a) Define dot product between two vectors A and B. Find the sine of the angle between the vectors $\vec{A}=\vec{i}-3\vec{j}+2\vec{k}$ and $\vec{B}=2\vec{i}-\vec{j}+\vec{k}$. **(08 Marks)**

(b) If $\vec{A}=\vec{i}-2\vec{j}+\vec{k}$ and $\vec{B}=\vec{i}+2\vec{j}-\vec{k}$, show that $(\vec{A}+\vec{B})$ and $(\vec{A}-\vec{B})$are orthogonal. **(06 Marks)**

(c) Show that the position vectors of the vertices of a triangle $\vec{A}=3(\sqrt{3}\vec{i}-\vec{j})$, $\vec{B}=6\vec{j}$ and $\vec{C}=3(\sqrt{3}\vec{i}+\vec{j})$, form an isosceles triangle. **(06 Marks)**

Module-II

3. (a) Obtain the Maclaurin's series expansion of $\log\sec x$ up to the terms containing x^6. **(08 Marks)**

(b) Prove that $xu_x+yu_y=\sin 2u$,where $u=\tan^{-1}[(x^3+y^3)/(x+y)]$, using Euler's theorem, **(06 Marks)**

(c) If $u=f(x/y, y/z, z/x)$, show that $xu_x+yu_y+zu_z=0$ **(06 Marks)**

OR

4. (a) Prove that $\sqrt{1+\sin 2x}=1+x-\dfrac{x^2}{2}-\dfrac{x^3}{3}+\dfrac{x^4}{24}+\ldots$, by using Maclaurin's series notion. **(08 Marks)**

(b) Using Euler's theorem, prove that $xu_x+yu_y=3\tan u$,where $u=\sin^{-1}[(x^2y^2)/(x+y)]$. **(06 Marks)**

(c) If $u=e^x\sin y, v=x+\log\sin y$, find $J\left(\dfrac{u,v}{x,y}\right)$. **(06 Marks)**

Module-III

5. (a) A particle moves along a curve $x=e^{-t}, y=2\cos 3t, z=2\sin 3t$ where t is the time variable. Determine

the components of velocity and acceleration vectors at $t=0$ in the direction of $\vec{i}+\vec{j}+\vec{k}$. **(08 Marks)**

(b) Find the unit normal to the surface $x^2y+2xz=4$ at $(2,-2,3)$ **(06 Marks)**

(c) Show that the vector field $\vec{F}=(4xy-z^3)\vec{i}+(2x^2)\vec{j}-(3xz^2)\vec{k}$ is irrotational. **(06 Marks)**

OR

6. (a) If $\vec{F}=(x+y+z)\vec{i}+\vec{j}-(x+y)\vec{k}$, show that $\vec{F}\times curl\vec{F}=0$ **(08 Marks)**

(b) If $\phi(x,y,z)=x^3+y^3+z^3-3xyz$, find $\nabla\phi$ & $|\nabla\phi|$ at $(1,-1,2)$ **(06 Marks)**

(c) Show that vector field $\vec{F}=[(xi+yj)/(x^2+y^2)]$ is solenoidal. **(06 Marks)**

Module-IV

7. (a) Obtain a reduction formula for $\int_0^{\pi/2}\sin^n xdx,(n>0)$. **(08 Marks)**

(b) Evaluate: $\int_0^{\infty}\frac{x^2dx}{(1+x^2)^3}$ **(06 Marks)**

(c) Evaluate $\iint_R xydxdy$ where R is the first quadrant of the circle $x^2+y^2=a^2, x\geq 0, y\geq 0.$ **(06 Marks)**

OR

8. (a) Obtain a reduction formula for $\int_0^{\pi/2}\cos^n xdx\ ,(n>0)$ **(08 Marks)**

(b) Evaluate : $\int_0^{2a}x^3\sqrt{2ax-x^2}\,dx$ **(06 Marks)**

(c) Evaluate: $\int_{-1}^{1}\int_0^{z}\int_{x-z}^{x+z}(x+y+z)dydxdz$ **(06 Marks)**

Module-V

9. (a) Solve: $(4xy+3y^2-x)dx+x(x+2y)dy=0$ **(08 Marks)**

(b) Solve: $[y\cos x+\sin y+y]dx+[\sin x+x\cos y+x]dy=0$ **(06 Marks)**

(c) Solve: $(1+y^2)dx=(\tan^{-1}y-x)dy$ **(06 Marks)**

OR

10. (a) Solve: $(x^3\cos^2 y-x\sin 2y)dx=dy$ **(08 Marks)**

(b) Solve: $(x+3y-4)dx+(3x+9y-2)dy=0$ **(06 Marks)**

(c) Solve: $dy+(y\cot x-\cos x)dx=0$ **(06 Marks)**

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