36532

B.Sc. V Semester (CBCS) Degree Examination, May/June - 2019

MATHEMATICS

Paper : IX and (5.2) : Applied Mathematics

(New)

Time : 3 Hours

Maximum Marks : 70

Answer **all** the sections.

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Section - A

Answer any **ten** of the following. **(10×2=20)**

1. Define Divergence of a vector function.
2. Find the normal derivative at the point (-3,1,-2) for $\phi(x,y,z)=x^3+yz$.
3. If c is any scalar and $\phi(x,y,z)$ is any scalar point function then prove that $\nabla(C\phi)=C\nabla\phi$.
4. Find the constant 'a' such that $f=y(ax^2+z)i+x(y^2-z^2)j+2xy(z-xy)k$ is solenoidal.
5. Prove that $\nabla.(\nabla\times f)=0$.
6. Find the area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ using Green's theorem.
7. Define Geodesics and Isoperimetric problems.
8. Solve the variational problem $\delta\int_0^1\left(y^2+x^2y'\right)dx=0, y(0)=0 y(1)=1$.
9. Define a homogeneous linear partial differential equation of second order.
10. Solve $r-6s+9t=0$.
11. Find PI of $\left(D^2-3DD'+2D'^2\right)z=e^{x+y}$.
12. Find C.F of $\left(3D-4D'-2\right)z=0$.

Section - B

Answer any **five** of the following : **(5×5=25)**

13. Find the equation of the tangent plane to the surface $z=x^2-y^2$ at the point (2,-1,3).
14. Show that $\nabla^2 f(r)=f''(r)+\frac{2}{r}f'(r)$ where $r=xi+yj+zk$.

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15. Show that $Curl[r\times(a\times r)]=3r\times a$ where a is a constant vector.

16. Using Green's theorem evaluate $\int_C e^{-x}(\sin y dx+\cos y dy)$ where C is the rectangle with vertices $(0,0),(\pi,0),\left(\pi,\frac{\pi}{2}\right) and \left(0,\frac{\pi}{2}\right)$.

17. Using divergence theorem show that

a) $\iint_S r.nds = 3V$

b) $\iint_S \nabla r^2.ds = 6V$

18. Evaluate $\oint_C F.dr$ where $F=2yi+3xj-z^2k$ using stoke's theorem, where C is the boundary of upper half of the surface of the sphere $x^2+y^2+z^2=9$.

19. Show that the external of $I=\int_{x_1}^{x_2}\sqrt{y\left[1+(y')^2\right]}dx$ is a parabola.

Section - C

Answer any **five** of the following. (5×5=25)

20. Solve $\left(2D^2-DD'-3D'^2\right)z=5e^{x-y}$.

21. Solve $\left(D^2-5DD'+4D'^2\right)z=\sin(4x+y)$

22. Solve $\left(D^2-DD'+D'-1\right)z=\cos(x+2y)$.

23. Solve $\left(D^2-D'^2+D-D'\right)z=e^{x+3y}$.

24. Reduce the equation.

$\frac{\partial^2 z}{\partial x^2}+x^2\frac{\partial^2 z}{\partial y^2}=0$ into a canonical form.

25. Obtain the solution for one dimensional heat equation $\frac{\partial u}{\partial t}=C^2\frac{\partial^2 u}{\partial x^2}$ by using the method of separation of variables.

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