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B.Sc. V Semester Degree Examination, March/April - 2023

MATHEMATICS - X

Paper No. 5.2 : Applied Mathematics

(CBCS)

Time : 3 Hours | Maximum Marks : 70

Note : *Answer **all** the Sections.*

SECTION - A

Answer **any five** of the following questions. **5x2=10**

1. Define Gradient of a scalar point function.

2. Find the maximal directional derivative of x^3y^2z at the point (1, −2, 3).

3. If f and g are irrotational, show that $f \times g$ is solenoidal.

4. State Stoke's theorem.

5. Define Stationary function and write the solution of Euler's equation when 'f' is independent of y.

6. Write one dimensional wave equation and write its appropriate solution.

7. Find the C.F. of $[2D^2 - DD^1 - 3D^{1^2}]z = 0$.

SECTION - B

Answer **any five** of the following questions. **5x6=30**

8. Prove that Curl (Curl $\vec{f}$) = grad (div $\vec{f}$) $- \nabla^2 \vec{f}$.

9. Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point (2, −1, 2).

10. If $u=x+y+z$, $v=x^2+y^2+z^2$ and $w=xy+yz+zx$ show that $[\nabla u \ \nabla v \ \nabla w]=0$.

P.T.O.

11. Verify Green's theorem for $\oint_C [(3x^2 - 8y^2)dx + 2y(2-3x)dy]$, where C is the boundary of the rectangular area enclosed by the lines $x=0$, $x=1$, $y=0$ and $y=2$.

12. Evaluate $\iint_S F\cdot n\,ds$, where $F = 4xzi + y^2j + yzk$ and S is the surface of the cube bounded by the planes $x=0$, $x=1$, $y=0$, $y=1$, $z=0$, $z=1$, by using Gauss divergence theorem.

13. Find the curve through (0, 1) and (1, 2) along which $I = \int_0^1 [y^2 - yy^1 + (y^1)^2]dx$ is minimum.

SECTION - C

Answer **any five** of the following questions. **5x6=30**

14. Solve $(D^2 - 5DD^1 + 4D^{1^2})z = \sin(4x+y)$.

15. Solve $(D^2 - DD^1 - 2D^{1^2})z = (y-1)e^x$.

16. Solve $(2DD^1 + D^{1^2} - 3D^1)z = 5\cos(3x-2y)$.

17. Solve $(D^2 - (D^1)^2 - 3D + 3D^1)z = xy$.

18. Reduce $\frac{\partial^2 z}{\partial x^2} = x^2\left(\frac{\partial^2 z}{\partial y^2}\right)$ to canonical form.

19. 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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