Hi-Tech Institute of Engineering & Technology
DEPARTMENT OF APPLIED SCIENCES
Course - B.Tech First Year
(SEM- I) ODD SEMESTER PUT EXAMINATION 2022-23

MODEL PAPER - 2

Subject Code:BAS-103   Subject Name: ENG.MATHS-I
Faculty Name: Mr. ManishAgg, Mr. Surendra Singh

Time: 3: 00 *Hours*   *Total Marks: 70*

SECTION-A

1. Attempt all question in brief.   2x 7 = 14

Q.No	Attempt all questions.	Marks	CO
1.	Find the characteristic equation if A= $\begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$	2	1
2.	Find the value of $\frac{\partial^3 u}{\partial x \partial y \partial z}$ if u $= e^{xyz}$.	2	2
3.	Find first order derivatives of $u = \log(x^2 + y^2)$.	2	2
4.	If u=x², v=y² find $\frac{\partial(u,v)}{\partial(x,y)}$	2	3
5.	Examine f(x, y) = x³+y³-3xy for maximum and minimum values.	2	3
6.	Evaluate $\int_0^1 \int_0^{\sqrt{ay}} xy \, dxdy$	2	4
7.	If $\emptyset = 3x^2y-y^3z^2$ find the grad $\emptyset$ at the point (1,-2,-1).	2	5

SECTION-B

2. Attempt any three of the following: 7 x 3 =21

Q.No	Question	Marks	CO
a.	Compute the inverse of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ by employing elementary row transformation.	7	1
b.	If y=sin (a sin⁻¹x), prove that $(1-x^2) \, y_{n+2} - (2n+1) \, xy_{n+1} - (x^2-a^2) \, y_n = 0$, Also find y_n at x=0	7	2
c.	Expand e^x. cos y near the point (1, $\pi/4$)	7	3
d.	Find the volume of solid bounded by the surface x=0, y=0, z=0 and x+y+z=1	7	4
e.	Given the vector field V=(x²-y²+2xz)i +(xz-xy+yz)j+(z²+x²)k find curl V.Show that the vector given curl V at P(1,2,-3) and P₁(2,3,12) are orthogonal.	7	5

SECTION-C

3. Attempt any one parts of the following: 7*1 = 7

Q.No	Question	Marks	CO
a.	Reduce the matrix $A = \begin{bmatrix} 1 & -2 & 1 & -1 \\ 1 & 1 & -2 & 3 \\ 4 & 1 & -5 & 8 \end{bmatrix}$ to normal form and hence find its rank.	7	1

b.	Test the consistency of the following system of liner equation and hence find the solution 4x-y=12, -x+5y-2z=0 , -2y+4z = -8.	7	1

4. Attempt any one parts of the following: 7*1 = 7

Q.No	Question	Marks	CO
a.	If $u = tan^{-1} \frac{x^3+y^3}{\sqrt{x}+\sqrt{y}}$, Find the value of $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{25}{16} sin4u - \frac{5}{4} sin2u$	7	2
b.	If $\frac{x^2}{a^2+u} + \frac{y^2}{b^2+u} + \frac{z^2}{c^2+u} = 1$ prove $2(x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}) = \left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 + \left(\frac{\partial u}{\partial z}\right)^2$	7	2

5. Attempt any one parts of the following: 7*1 = 7

Q.No	Question	Marks	CO
a.	Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube.	7	3
b.	If u = x+2y+z, v = x-2y+3z, w = 2xy-xz+4yz-2z² Show that they are functionally related and find the relation.	7	3

6. Attempt any one parts of the following: 7*1 = 7

Q.No	Question	Marks	CO
a.	Show that by change order of integration $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dydx = \frac{16a^2}{3}$.	7	4
b.	Evaluate $\iint \frac{dxdy}{(\sqrt{1-x}\ \sqrt{1-y}\ )}$	7	4

7. Attempt any one parts of the following: 7*1 = 7

Q.No	Question	Marks	CO
a.	Using Green's theorem to evaluate $\int_c \left[(x^2 y\ )dx + (x^2\ )dy\right]$ where c is the boundary described counter clockwise of the triangle with vertices (0,0), (1,0), (1,1).	7	5
b.	Use Green's Theorem to evaluate $\int (x^2 + xy)dx + (x^2 + y^2)dy$ is the square formed by the lines y=±1, x=±1.	7	5