Hall Ticket Number:

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**Code No. : 13751 S N/O**

# VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

*Accredited by NAAC with A++ Grade*

## B.E. III-Semester (Bridge Course) Supplementary Examinations, August-2023

## Matrix Theory and Vector Calculus

Time: **3 hours** Max. Marks: 50

*Note: Answer all questions from* ***Part-A*** *and any* ***FIVE*** *from* ***Part-B***

***Part-A (10× 2 = 20 Marks)***

| Q. No. | Stem of the question | M | L | CO | PO |
|---|---|---|---|---|---|
| 1. | If $z = x^y$ then find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$. | 2 | 2 | 1 | 1,12 |
| 2. | Evaluate $\int e^x sinx\ dx$ | 2 | 1 | 1 | 1,12 |
| 3. | If $\emptyset = xy^2z^3$, then find normal vector at (1,1,1). | 2 | 1 | 2 | 1,12 |
| 4. | Write the geometrical interpretation of divergence. | 2 | 1 | 2 | 1,12 |
| 5. | Evaluate $\int_0^1 \int_0^x xy\ dydx$ | 2 | 2 | 3 | 1,12 |
| 6. | State Green's theorem for plane. | 2 | 1 | 3 | 1,12 |
| 7. | Define consistent and inconsistent system of equations. | 2 | 1 | 4 | 1,12 |
| 8. | If 1,2,3 are Eigen values of matrix A then find trace($A^2$) and det($A^2$) | 2 | 2 | 4 | 1,12 |
| 9. | If $f = xcosy + ycosx$ then find $\frac{dy}{dx}$ by implicit differentiation | 2 | 2 | 1 | 1,12 |
| 10. | Define Solenoidal & Irrotational vector. | 2 | 1 | 2 | 1,12 |
| | ***Part-B (5×6 = 30 Marks)*** | | | | |
| 11. | If $U = log(x^3 + y^3 + z^3 - 3xyz)$, then Prove that $\left[\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right]^2 u = -\frac{9}{(x+y+z)^2}$ | 6 | 3 | 1 | 1,12 |
| 12. a) | If $\bar{F} = grad(x^2 + y^2 + z^2 - 2xyz)$, then find div$\bar{F}$ at (1,-1,0) | 4 | 3 | 2 | 1,12 |
| b) | If $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$ and $r = \lvert\bar{r}\rvert$, $thenfind\ \nabla(r^2)$. | 2 | 1 | 2 | 1,12 |
| 13. | Find the work done $\int_c \bar{F}.d\bar{r}$ in moving particle in the force field $\bar{F} = (5xy - 6x^2)\bar{\imath} + (2y - 4x)\bar{\jmath}$ *along the curve* $x^3 = y$ *from* $x = 1, to\ x = 2$. | 6 | 3 | 3 | 1,12 |
| 14. | Find Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ | 6 | 3 | 4 | 1,12 |
| 15. a) | If $z = \frac{cosy}{x}$ and $x = u^2 - v, y = e^v$, then find $\frac{\partial z}{\partial v}$. | 3 | 2 | 1 | 1,12 |
| b) | Show that the vector $\bar{F} = (x^2 - yz)\bar{\imath} + (y^2 - zx)\bar{\jmath} + (z^2 - xy)\bar{k}$ is irrotational. | 3 | 2 | 2 | 1,12 |

*Contd... 2*

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|---|---|---|---|---|---|
| 16. a) | Evaluate $\iint_R (x+y)\,dxdy$ Where R is boundary by $y = x^2$ and $y = x$. | 3 | 3 | 3 | 1,12 |
| b) | Solve the system of equations. $2x + 2y + z = 6, 4x + 3y + 2z = 4, x + y + z = 0$ | 3 | 2 | 4 | 1,12 |
| 17. | Answer any ***two*** of the following: | | | | |
| a) | Evaluate $\int e^{cosx} sin2x\,dx$ | 3 | 2 | 1 | 1,12 |
| b) | In what direction from $(3, 1, -2)$ the directional derivative of $f = x^2y^3z^4$ is maximum. | 3 | 2 | 2 | 1,12 |
| c) | Evaluate $\int_0^1 \int_0^1 \int_0^1 \frac{1}{xyz}\,dzdydx$ | 3 | 2 | 3 | 1,12 |

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

| | | |
|---|---|---|
| i) | Blooms Taxonomy Level – 1 | 21.53% |
| ii) | Blooms Taxonomy Level – 2 | 40% |
| iii) | Blooms Taxonomy Level – 3 & 4 | 38.47% |

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III Rd Sem