Hall Ticket Number:

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**Code No. : 13711A**

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

**B.E. (CBCS) III-Semester Main Examinations, December-2018**

**Bridge Course: Fundamentals of Linear Algebra and Vector Calculus**

(Civil, EEE, ECE & Mech. Engg.)

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

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

| Q.No. | | Stem of the question | M | L | CO | PO |
|---|---|---|---|---|---|---|
| | | ***Part-A (5 × 2 = 10 Marks)*** | | | | |
| 1. | | Find First order partial derivatives of the function $\tan^{-1}(x+y)$. | 2 | 1 | 1 | 1 |
| 2. | | Evaluate $\int \frac{sin^6x}{cos^8x}dx$. | 2 | 2 | 2 | 1 |
| 3. | | Define Divergence and Curl of a vector point function. | 2 | 1 | 3 | 2 |
| 4. | | Evaluate $\int_0^3 \int_0^1 (x^2+3y^2)dydx$. | 2 | 2 | 4 | 1 |
| 5. | | State Stoke's theorem. | 2 | 1 | 5 | 2 |
| | | ***Part-B (5 × 8 = 40 Marks)*** | | | | |
| 6. | a) | Define Implicit function, find $\frac{dy}{dx}$ when $x^y + y^x = c$ | 4 | 1 | 1 | 2 |
| | b) | If $z = f(x+ct)+g(x-ct)$, prove that $\frac{\partial^2 z}{\partial t^2} = c^2 \frac{\partial^2 z}{\partial x^2}$. | 4 | 2 | 1 | 1 |
| 7. | a) | Evaluate $\int e^{\tan t} sec^2 t\, dt$. | 4 | 1 | 2 | 1 |
| | b) | Evaluate $\int \frac{\cos x}{1+sin^2x}dx$ | 4 | 1 | 2 | 1 |
| 8. | a) | Define Solenoidal Vector, Find $P$ if $(x+Py)\bar{\imath}+(y-3z)\bar{\jmath}+(x-2z)\bar{k}$ is Solenoidal. | 4 | 1 | 3 | 2 |
| | b) | Find the directional derivative of the function $\emptyset = xy^2 + yz^3$ at the point (2,-1,1) in the direction of the normal to the surface $x\log z - y^2 + 4 = 0$ at (-1,2,1). | 4 | 2 | 3 | 1 |
| 9. | a) | Evaluate $\iint_S \bar{F}.\hat{n}\, ds$ where $\bar{F} = 12x^2y\bar{\imath} - 3yz\bar{\jmath} + 2z\bar{k}$ and S is the surface of the plane $x+y+z=1$ included in the first octant. | 4 | 2 | 4 | 1 |
| | b) | Evaluate $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} (x+y+z)dxdydz$. | 4 | 2 | 4 | 1 |
| 10. | a) | State Green's theorem and evaluate $\int_c (3x^2-8y^2)dx + (4y-6xy)dy$ where c is the boundary of the region given by $x=0, y=0, x+y=1$. | 4 | 2 | 5 | 2 |
| | b) | Using Gauss divergence theorem, Show that $\int_s (ax\bar{\imath}+by\bar{\jmath}+cz\bar{k})\cdot\bar{n}\, ds = \frac{4\pi}{3}(a+b+c)$, S: surface of the Sphere $x^2+y^2+z^2=1$. | 4 | 2 | 5 | 2 |

*Contd...2*

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|---|---|---|---|---|---|
| 11. a) | If $z = e^{ax+by} f(ax - by)$, then prove that $b\frac{\partial z}{\partial x} + a\frac{\partial z}{\partial y} = 2abz$. | 4 | 2 | 1 | 2 |
| b) | Evaluate $\int e^x(\tan x - \log\cos x)dx$. | 4 | 1 | 2 | 1 |
| 12. | Answer any ***two*** of the following: | | | | |
| a) | Find the angle between the surfaces $x^2 + xy + y^2z + 3xyz = 4$ *at* (1,2,1), (-1,1,-1). | 4 | 2 | 3 | 2 |
| b) | Evaluate $\oint_c \bar{F}.\overline{dr}$ where $\bar{F} = (2x - y + 2z)\bar{\imath} + (x + y - z)\bar{\jmath} + (3x - 2y - 5z)\bar{k}$ along the circle $x^2 + y^2 = 4$ in the $xy$ −plane. | 4 | 2 | 4 | 2 |
| c) | Evaluate $\oint_c \bar{F}.\overline{dr}$ by stokes theorem, where $\bar{F} = y^2\bar{\imath} + x^2\bar{\jmath} - (x + z)\bar{k}$ and c is the boundary of the triangle with vertices (0,0,0),(1,0,0),(1,1,0). | 4 | 2 | 5 | 2 |

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

| S. No. | Criteria for questions | Percentage |
|---|---|---|
| 1 | Fundamental knowledge (Level-1 & 2) | 40% |
| 2 | Knowledge on application and analysis (Level-3 & 4) | 60% |
| 3 | *Critical thinking and ability to design (Level-5 & 6) (*wherever applicable) | --- |