Hall Ticket Number:

Code No. : 13701 C

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) III-Semester Main Examinations, December-2017

Bridge Course: Fundamentals of Linear Algebra & Calculus

(For CSE & IT)

Time: 3 hours Max. Marks: 50

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

Part-A (15 Marks)

1. If $= f(r,s,t)$ *where* $r = \emptyset(x,y), s = \varphi(x,y), t = \tau(x,y)$ then write the formula of $\frac{\partial u}{\partial x}$. [1]
2. Evaluate $\int cos^2 x \, sinx \, dx$. [1]
3. Define rank of the matrix. [1]
4. Write any two Dirichlet's conditions of a Fourier series. [1]
5. Define Even and Odd function of the Fourier series. [1]
6. Find $\frac{\partial f}{\partial x}, \frac{\partial^2 f}{\partial x \partial y}$ of the function $x^3 + y^3 - 3axy$. [2]
7. Evaluate $\int x^2 \log x \, dx$. [2]
8. Find the rank of the matrix $\begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$ [2]
9. Find a_0 value for the function $f(x) = e^{-x}$ *in the interval* $0 < x < 2\pi$ [2]
10. Define Half-range Sine and cosine series. [2]

Part-B (5 × 7 = 35 Marks)
(All sub-questions carry equal marks)

11. a) If $z = f(x,y), where\ x = e^u + e^v, y = e^{-u} - e^v$ then show that $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$.

    b) If $f = \frac{1}{\sqrt{x^2+y^2+z^2}}$ Prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$.

12. a) Evaluate $\int \sqrt{a^2 - x^2}\, dx$.

    b) Evaluate $\int e^x \sin e^x \, dx$.

13. a) Test for consistency and solve the following equations:
    $3x + 3y + 2z = 1, x + 2y = 4, 10y + 3z = -2, 2x - 3y - z = 5$.

    b) Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$

14. a) Obtain the Fourier series for the function $f(x) = x \sin x$ in the interval $(0, 2\pi)$.

    b) Find the Fourier series expansion for the function $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$

15. a) Find the Half-range cosine series for the function $f(x) = x^2$ *in* $0 \le x \le \pi$.

    b) Obtain Fourier series for the function $\begin{cases} 1 + \frac{2x}{\pi}, & -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi}, & 0 \le x \le \pi \end{cases}$

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16. a) If $u = x^2 tan^{-1}\frac{y}{x} - y^2 tan^{-1}\frac{x}{y}$ then show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{x^2 - y^2}{x^2 + y^2}$.

    b) Evaluate $\int e^{ax} \sin bx \, dx$.

17. Answer any ***two*** from the following:

    a) Reduce the matrix $\begin{bmatrix} 2 & 1 & -6 & -3 \\ 3 & -3 & 2 & 1 \\ 1 & 1 & 2 & 1 \end{bmatrix}$ to normal form and find its rank.

    b) Obtain the Fourier series expansion of $f(x) = 2x - x^2$ in (0, 3) and $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots = \frac{\pi^2}{12}$

    c) Obtain the Fourier series expansion of $f(x) = |x|$ in $-\pi < x < \pi$.