Hall Ticket Number:

Code No.: 1112 O

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. I Year I-Semester (Old) Examinations, December- 2015

Mathematics-I

Time: 3 hours Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1) Define linearly independent and linearly dependent vectors.

2) Find the eigen values of the matrix $A=\begin{bmatrix} 3 & 1 \\ 4 & 0 \end{bmatrix}$

3) Write the Leibnitz test for testing the convergence of an alternating series.

4) $\sum u_n, \sum v_n$ are two series of positive terms such that $u_n \le v_n, \forall n$ .compare the convergence or divergence of one series with reference to the nature of the other .

5) Define Center of curvature and write the formula for finding the center of curvature of a curve at a point (x,y) in Cartesian coordinates.

6) Discuss the symmetry property and asymptotic property of the curve $(y-2)\left[(x+3)^2+4a^2\right]=8a^3$

7) Find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$, when $u=\log\left[\frac{x^3+y^3}{x+y}\right]$

8) Express $Sin\,x\,Cos\,y$ as a polynomial in x,y of 3rd degree.

9) Evaluate the triple integral $\int_{\phi=0}^{\pi}\int_{\theta=0}^{\pi/2}\int_{r=0}^{a} rSin\theta\, Sin\phi\, dr\, d\theta\, d\phi$

10) Find the area of the region bounded by the curve $y = x^2$ and the line $y = x$

Part-B (Marks: 5 X 10= 50)

(All bits carry equal marks)

11) (a) Test the consistency of the system of equations $3x+3y+2z=1$; $x+2y=4$; $2x-3y-z=5$ and solve them if they are consistent

(b) Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to the canonical form and specify the matrix of transformation.

12) (a) Define a series. Discuss the nature of convergence of the following series

i) $\sum_{n=1}^{\infty}\sqrt{\frac{3^n-1}{2^n-1}}$ ii) $\sum_{n=1}^{\infty}\frac{x^n}{1+x^n}$

(b) Define (i) alternating series (ii) Absolute convergence of a series (iii) Conditional convergence of a series. Also test the Absolute convergence of the series $\sum_0^{\infty}\frac{(-1)^{n-1}}{n^2-1}$

Contd..2..

13) (a) Find the radius of curvature at the origin of the curve $y^2 = x^2 \frac{a+x}{a-x}$

(b) Show that the Evolute of the ellipse $x = a\cos\theta; y = b\sin\theta$ is $(ax)^{2/3} + (by)^{2/3} = (a^2 - b^2)^{2/3}$

14) (a) Using Lagrange's method of undetermined multipliers, Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube.

(b) If $u = 2xy, v = x^2 - y^2, x = r\cos\theta, y = r\sin\theta$, find $\frac{\partial(u,v)}{\partial(r,\theta)}$

15) (a) Evaluate $\iint_R (x+y)\,dydx$, R is the region bounded by $x = 0, x = 2, y = x, y = x+2$

(b) Evaluate $\int_0^\infty \int_0^x e^{-xy} y\,dydx$ by changing the order of the integration

16) (a) State Cayley-Hamilton theorem and verify with the matrix A= $\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ and find A^{-1}

(b) Examine the function $f(x,y) = x^2y^3$ where $x + y = 35$ for extreme values.

17) (a) Test the convergence of (i) $1 + \frac{3}{7}x + \frac{3\cdot6}{7\cdot10}x^2 + \frac{3\cdot6\cdot9}{7\cdot10\cdot13}x^3 + \cdots\cdots$

(ii) $\sum \frac{1\cdot3\cdot5.....(2n-1)}{2\cdot4\cdot6....(2n)} \frac{x^{2n+1}}{(2n+1)}$

(b) Trace the curve $y^2 = \frac{x^2(1+x)}{2-x}$

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