Hall Ticket Number:

Code No.: 1112 S

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. I Year I-Semester (Supplementary) Examinations, May/June-2016

Mathematics-I

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

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

Part-A (15 Marks)

1. Define linearly independent and linearly dependent of vectors. [1]
2. Define absolutely convergent and test whether the series $\sum \frac{(-1)^n}{n\sqrt{n}}$ converges absolutely or not. [1]
3. Find the curvature of the circle $y = \sqrt{a^2 - x^2}$. [1]
4. Expand $\tan^{-1} x$ in powers of x upto three terms by using Taylor's series. [1]
5. Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dy\,dx}{1 + x^2 + y^2}$. [1]
6. Find the eigen values of the matrix $A = \begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$ [2]
7. Test the convergence of the series $\sum \left(1 + \frac{1}{n^p}\right)^{n^{p+1}}$, $p > 0$. [2]
8. Find the envelope of the family of straight lines $x\cos\alpha + y\sin\alpha = p$, where α is a parameter [2]
9. Find the extremum value of $f(x) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$ at (2,0). [2]
10. Evaluate $\int_0^4 \int_0^{x^2} e^{y/x}\, dy\, dx$. [2]

Part-B (5 X 7=35 Marks)

11. a) Test the consistency of the following equations, and if they are consistent, solve them.
$4x + 7y - 5z = 3$, $9x - 11y + 5z = -1$
$11x - 9y + 7z = 5$, $3y + 10z = 23$. [3]

b) Find the eigenvalues and the corresponding eigenvectors of the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ [4]

12. a) Test the convergence of the series $\frac{1}{2\sqrt{1}} + \frac{x^2}{3\sqrt{2}} + \frac{x^4}{4\sqrt{3}} + \frac{x^6}{5\sqrt{4}} + \text{-------}$. [3]

b) Discuss the convergence of the series $\frac{1}{2} + \frac{1.3}{2.4} + \frac{1.3.5}{2.4.6} + \text{-------}$. [4]

13. a) Find the radius of curvature for the curve $r^n = a^n.\cos n\theta$ [4]

b) Find the envelope of the family of lines given by, $y = mx + \sqrt{a^2m^2 + b^2}$, where m is a parameter. [3]

14. a) Expand $x^2y + 3y - 2$ in powers of $(x-1)$ and $(y+2)$ using Taylor's theorem. [3]

b) Find the minimum values of the function $f(x,y) = xy + \frac{9}{x} + \frac{3}{y}$. [4]

Contd…2

15. a) Evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} dy\,dx$ by changing the order of integration. [3]

b) Find the volume bounded by xy-plane the cylinder $x^2 + y^2 = 1$ and the plane $x+y+z = 3$. [4]

16. a) If $A = \begin{bmatrix} 3 & 1 & -1 \\ -2 & 1 & 2 \\ 0 & 1 & 2 \end{bmatrix}$, then show that the matrix A is diagonalizable. Hence, find P such that $P^{-1}AP$ is a diagonal matrix. [4]

b) Test the convergence $1 + \frac{x}{2} + \frac{2!}{3^2}x^2 + \frac{3!}{4^3}x^3 + \text{------}$ [3]

17. Answer any **two** of the following: [7]

a) Find the radius of curvature for the curve $y^2(a-x) = x^2(a+x)$ at the origin.

b) If $x = e^u \cos v$, $y = e^u \sin v$, find $\frac{\partial(u,v)}{\partial(x,y)}$.

c) Find the volume of the solid bounded by the planes $x = 0$, $y = 0$, $x+y+z = 1$ and $z = 0$.

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