

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Code No. : 11121 AO

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. I-Semester Backlog Examinations, Jan./Feb.-2024**CALCULUS**

(Common for all)

Time: 3 hours

Max. Marks: 60

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.	Write the necessary condition for convergence of a series.	2	1	1	1,12
2.	Define Alternating Series.	2	1	1	1,12
3.	Define Evolute of a curve.	2	1	2	1,12
4.	Find the radius of curvature at (0,0) of the curve $2x^4 + 2y^4 + 4x^2y + xy - y^2 + 2x = 0$.	2	2	2	1,12
5.	Define total derivative.	2	1	3	1,12
6.	Write the coefficient of x^2 for the expansion of $e^x \sin y$ at (0,0).	2	2	3	1,12
7.	Write the physical interpretation of gradient.	2	1	4	1,12
8.	Find a unit normal vector to the given surface $x^2y + 2xz = 4$ at the point (2, -2, 3).	2	2	4	1,12
9.	If u and v are functions of x, y then define jacobian.	2	1	5	1,12
10.	Evaluate $\int_0^2 \int_0^3 xy \, dx \, dy$.	2	2	5	1,12
Part-B (5 × 8 = 40 Marks)					
11. a)	Test for convergence of the series $\frac{1}{4.7.10} + \frac{4}{7.10.13} + \frac{9}{10.13.16} + \dots$	4	2	1	1,12
b)	Show that the series $1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots$ is Conditionally Convergent.	4	3	1	1,12
12. a)	Obtain the Taylor's series expansion of the function $f(x) = \sin x$ in powers of $(x - \frac{\pi}{2})$.	4	3	2	1,12
b)	Find the evolute of the parabola $y^2 = 4ax$ at any point P(x, y).	4	3	2	1,12
13. a)	If $u = f(y - z, z - x, x - y)$ prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.	4	2	3	1,12
b)	Using Lagrange's method of undetermined multipliers find the minimum value of $x^2 + y^2 + z^2$, given that $xyz = a^3$.	4	3	3	1,12

Contd... 2

14. a)	Find the directional derivative of $\phi = x^2yz + 4xz^2$ at $(1, -2, -1)$ in the direction of $2i - j - 2k$.	4	2	4	1,12
b)	Show that the vector $(x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$ is irrotational and find its scalar potential.	4	3	4	1,12
15. a)	Evaluate by Green's theorem $\int_C (y - \sin x)dx + \cos x dy$, where C is the triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}, \pi y = 2x$.	4	3	5	1,12
b)	By Changing the order of integration, evaluate $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dy dx$.	4	3	5	1,12
16. a)	Test for convergence of the series $1 + \frac{x}{2^2} + \frac{x^2}{3^2} + \frac{x^3}{4^2} + \dots (x > 0)$.	4	2	1	1,12
b)	Find the radius of curvature at any point on the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.	4	3	2	1,12
17.	Answer any two of the following:				
a)	Using implicit differentiation, find $\frac{dy}{dx}$ when $\cot^{-1}\left(\frac{x}{y}\right) + y^3 + 1 = 0, x > 0, y > 0$.	4	3	3	1,12
b)	Find $\text{div } \vec{f}$ where $\vec{f} = r^n \vec{r}$. Find n if it is Solenoidal.	4	3	4	1,12
c)	Change into polar co-ordinates and evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dy dx$.	4	4	5	1,12

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

i)	Blooms Taxonomy Level - 1	15%
ii)	Blooms Taxonomy Level - 2	30%
iii)	Blooms Taxonomy Level - 3 & 4	55%
