Hall Ticket Number:

Code No. : 11114 S N

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. I-Semester Supplementary Examinations, August-2023

Calculus

(Common to all branches)

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 statement of D'Alembert Ratio test.	2	1	1	1,2,12
2.	Show that the series $\sum_{n=1}^{\infty}\left[\frac{1}{n(n+1)}\right]$ is convergent.	2	1	1	1,2,12
3.	Using Maclaurin's series expand e^{sinx} up to second degree.	2	2	2	1,2,12
4.	Find the radius of curvature at origin for the curve $y-x=x^2+2xy+y^2$.	2	2	2	1,2,12
5.	Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if $z=\log(x^2+y^2)$.	2	1	3	1,2,12
6.	Find any two stationary points of the function $f(x,y)=x^3+3xy^2-15x^2-15y^2+72x$.	2	1	3	1,2,12
7.	Show that the position vector $\bar{r}$ is irrotational vector	2	1	4	1,2,12
8.	Find the normal vector to the surface $\emptyset = x^3 -- y^3+3xyz$ at $(1,2,3)$.	2	2	4	1,2,12
9.	Change the order of integration of $I=\int_{-a}^{a}\int_{0}^{\sqrt{a^2-y^2}} f(x,y)dxdy$.	2	2	5	1,2,12
10.	Find the Jacobian of the polar coordinates.	2	1	5	1,2,12
	Part-B (5 × 8 = 40 Marks)				
11. a)	Test for the convergence of the series $\sum_{n=1}^{\infty}\sqrt[3]{(n^3+1)}-n$.	4	2	1	1,2,12
b)	Discuss the convergence of the series $x-\frac{x^2}{4}+\frac{x^3}{9}-\frac{x^4}{16}+$...........	4	3	1	1,2,12
12. a)	Find the radius of curvature at $\left(\frac{1}{4},\frac{1}{4}\right)$ on the curve $\sqrt{x}+\sqrt{y}=1$.	4	1	2	1,2,12
b)	Show that the equation of the evolute of the parabola $y^2=4ax$ is $4(x-2a)^3=27ay^2$.	4	3	2	1,2,12
13. a)	If $u=tan^{-1}\left[\frac{2xy}{x^2-y^2}\right]$ then Prove that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$.	4	2	3	1,2,12
b)	A rectangular box open at the top is to have a volume of 32 cubic feet. Find the dimensions of the box requiring least material for its construction.	4	4	3	1,2,12

Contd... 2

14.	a)	Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point $P = (1, 2, 3)$ in the direction of the line PQ, where $Q = (5, 0, 4)$.	4	3	4	1,2,12
	b)	A Fluid motion is given by $\overline{v} = (y\sin z - \sin x)\overline{i} + (x\sin z + 2yz)\overline{j} + (xy\cos z + y^2)\overline{k}$ is this motion is irrotational ? If so, find the velocity potential $\emptyset$ such that $\overline{v} = \nabla\emptyset$.	4	4	4	1,2,12
15.	a)	Evaluate $\iint_R xy(x+y)dxdy$, where R is the region bounded by the curves $y = x^2$ and $y = x$.	4	3	5	1,2,12
	b)	Apply the Green's theorem to evaluate $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the region bounded by the triangle $x = 0, y = 0$ *and* $x + y = 1$.	4	4	5	1,2,12
16.	a)	Test for the convergence of the series $\left(\frac{2^2}{1^2} - \frac{2}{1}\right)^{-1} + \left(\frac{3^3}{2^3} - \frac{3}{2}\right)^{-2} + \left(\frac{4^4}{3^4} - \frac{4}{3}\right)^{-3} + \ldots\ldots\ldots$	4	2	1	1,2,12
	b)	Find the Centre of Curvature of $xy(x+y) = 2$ at $(1, 1)$ and hence find the Circle of Curvature.	4	2	2	1,2,12
17.		Answer any ***two*** of the following:				
	a)	If $u = x^2 + y^2 + z^2$ and $x = e^{2t}, y = e^{2t}\cos 3t,\ z = e^{2t}\sin 3t$ then Find $\frac{du}{dt}$ as total derivative and verify the result by direct substitution.	4	2	3	1,2,12
	b)	Define Jacobian of function of two variables and evaluate $\int\int e^{x^2+y^2}dxdy$ over the first quadrant of the circle $x^2 + y^2 = 1$ by change into polar coordinates.	4	3	4	1,2,12
	c)	Find the work done in moving a particle in the force field $\overline{F} = (x^2 - y^2 + x)i - (2xy + y)j$ in xy-plane along the curve defined by $y^2 = x$, *from* $(0,0)$ *to* $(1,1)$.	4	4	5	1,2,12

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	35%
iii)	Blooms Taxonomy Level – 3 & 4	45%

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