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Code No. : 11101 A OS

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. I-Semester Supplementary Examinations, September-2022

Engineering Mathematics-I

(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.	Expand $\log_e(1+x)$ in powers of x up to third degree.	2	1	1	1,12
2.	Define envelop of one parameter family of curves	2	1	1	1,12
3.	If $Z = x^3 + y^3 + 3xy$, then show that $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$	2	2	2	1,12
4.	If $z = f(x, y), where\ x = \emptyset(r, s), y = \varphi(r, s)$ then write total derivative of z with respect $r\ and\ s$.	2	1	2	1,12
5.	Define solenoidal vector.	2	1	3	1,12
6.	If $\bar{F} = (xy + z^2)\bar{\imath} + (3x^2 - z)\bar{\jmath} + (3xz^2 - y)\bar{k}$ then find divergence of $\bar{F}$	2	1	3	1,12
7.	Evaluate $\int_0^1 \int_0^1 \frac{1}{\sqrt{1-x^2}.\sqrt{1-y^2}}\ dydx$	2	2	4	1,12
8.	State Stokes's theorem for surface.	2	1	4	1,12
9.	Check for convergence of the series $1 + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \frac{1}{9} + \frac{1}{11} + ----$	2	2	5	1,12
10.	Define absolutely convergence and conditionally convergence.	2	1	5	1,12
	Part-B (5 × 8 = 40 Marks)				
11. a)	Find the radius of curvature at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ of the curve $x^3 + y^3 = 3axy$.	4	2	1	1,12
b)	Find the envelope of the family of lines $y = mx + \sqrt{(1+m^2)}$, m being parameter.	4	2	1	1,12
12. a)	Discuss the maxima and minima of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$.	4	3	2	1,12
b)	Expand $f(x, y) = tan^{-1}\left(\frac{y}{x}\right)$ $in\ powers\ of$ $(x-1)$ & $(y-1)$ up to third degree terms.	4	3	2	1,12

Contd... 2

		M	L	CO	PO
13. a)	Find the Directional derivative of $\emptyset = x^2yz + 4xz^2$ at (1, -2, -1) in the direction of the vector $2\bar{\imath} - \bar{\jmath} - 2\bar{k}$.	4	2	3	1,12
b)	Prove that $\nabla \cdot \frac{\bar{r}}{r} = 2r^{-1}$. Where $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$ and $r = \sqrt{x^2+y^2+z^2}$.	4	2	3	1,12
14. a)	Evaluate by Green's theorem $\int_c (x^2 - 2xy)dx + (x^2y + 3)dy$ Where c is boundary of $y = x^2$ and $x = y$.	5	3	4	1,12
b)	Change the order of integration of $\int_0^1 \int_0^{\sqrt{1-y^2}} f(x,y)\, dxdy$	3	1	4	1,12
15. a)	Test the convergence of the series $1 + \frac{x}{2} + \frac{x^2}{5} + \frac{x^3}{10} + \frac{x^4}{17} + - - - -$	5	3	5	1,12
b)	Test the convergence of the series $\sum \left(\frac{n-1}{n}\right)^{-n^2}$	3	3	5	1,12
16. a)	Find the evolute of the rectangular hyperbola $xy = c^2$	4	2	1	1,12
b)	If $U = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ then find $x\frac{\partial U}{\partial x} + y\frac{\partial U}{\partial y} + z\frac{\partial U}{\partial z}$.	4	3	2	1,12
17.	Answer any ***two*** of the following:				
a)	Show that the vector $\bar{F} = (y+z)\bar{\imath} + (z+x)\bar{\jmath} + (x+y)\bar{k}$ is Irrotational and find the scalar function $\emptyset$ such that $\bar{F} = \nabla\emptyset$	4	3	3	1,12
b)	Evaluate $\int_0^{log2} \int_0^{x} \int_0^{x+y} e^{x+y+z}\, dxdydz$	4	3	4	1,12
c)	Test the convergence of the series $\sum \frac{(n!)^2}{(2n)!}$	4	2	5	1,12

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

i)	Blooms Taxonomy Level – 1	21.25%
ii)	Blooms Taxonomy Level – 2	37.5%
iii)	Blooms Taxonomy Level – 3 & 4	41.25%

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