Seat No.:		Q. Paper Code: FTC-A-023	SET	P

Fabtech Technical Campus, College of Engineering & Research, Sangola

(An Autonomous Institute)

All UG Programs

Academic Year: -2025-26, Semester-I

Engineering Mathematics-I (25UGS11004)

Regular End Semester Examination 2025-26 [Dec./Jan.]

Class:	F. Y. B. Tech.	**Day & Date:**	Saturday, 10/01/2026
Duration:	03 Hrs.	**Max. Marks:**	60 Marks
Time:	10:00 AM TO 01:00 PM		

Instructions:

1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in the Page No.3 of answersheet.
2) Don't forget to mention the question paper set (P/Q/R) on the top of the page 3.

Q. 1	**Multiple Choice Questions (MCQs) Each question carries 1 mark**	**Marks: 10**	
		CO	**BL**
1	$(sin\,\theta + icos\theta)^5 =$ _____ a) $sin\,5\theta - i\,cos5\theta$ b) $cos\,5\theta - i\,sin5\theta$ c) $cos\,4\theta + i\,sin4\theta$ d) None	1	1
2	If U=cosh(x+iy) then imaginary part of U is____ a) sinhx siny b) - sinx coshy c) sinx coshy d) -sinh(x) siny	1	1
3	If x = sin $(u + v)$ then $\frac{\partial x}{\partial v} =$ _____ a) $cos\,(u + v)$ b) $(u + v)$ c) $(u + v)$ d) $sin\,(u + v)$	2	1
4	If $z = tan^{-1}\left(\frac{x}{y}\right)$ then $\frac{\partial z}{\partial x} =$ ... a) $\frac{x}{x^2+y^2}$ b) $-\frac{x}{x^2+y^2}$ c) $\frac{y}{x^2+y^2}$ d) $-\frac{y}{x^2+y^2}$	2	1
5	The function $f(x, y) = 0$ has a saddle point if----- a) $rt - s^2 > 0$ b) $rt - s^2 < 0$ c) $rt - s^2 = 0$ d) None	3	1
6	Let $u = f(x, y, z)$ be given function subject to $\emptyset(x, y, z) = 0$ then in Lagrange Method of undetermined multipliers, Lagrange function is given by $F(x, y, z, \lambda) =$ _____ a) $f.\lambda\emptyset$ b)) $f/\lambda\emptyset$ c)) $f\lambda + f.\emptyset$ d) $f + \lambda\emptyset$	3	1
7	The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 = \left(\frac{dy}{dx}\right)^{3/2}$ is ____ a) 2, 6 b) 6, 2 c) 2, 3 d) 3, 2	4	1
8	The orthogonal trajectories of the family of the circles $x^2 + y^2 = a^2$ where a is parameter are_____ a) $y = mx^2$ b) $y = mx$ c) $y^2 = mx^2$ d) none	4	1
9	If $\emptyset = 2x^3 + 3y^2 + 4z^2$ then $curl(grad\,\emptyset) =$_____ a) $\nabla^2 u$ b) ∇u c) 1 d) 0	5	1

10	Maximum value of directional derivative of scalar point function $\emptyset(x, y, z)$ is ___ a) $\lvert\emptyset\rvert$ b) $\lvert\nabla\emptyset\rvert$ c) $\nabla\emptyset$ d) None	5	1

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All UG Programs

Academic Year:-2025-26, Semester-I

Engineering Mathematics-I (25UGS11004)

Regular End Semester Examination 2025-26 [Dec./Jan.]

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4) Make suitable assumptions if necessary and state it clearly.
5) Use of non-programmable calculator is allowed.

Q. No.	Questions	Marks	CO	BL
Q. 2	**Attempt any two of the following**	**10**		
1	If n is positive integer, then prove that: $(-1+i\sqrt{3})^{3n} + (-1-i\sqrt{3})^{3n} = 2^{3n+1}$	**5**	1	3
2	If $tan(A+iB) = x+iy$, Prove that i) $tan\,2A = \frac{2x}{1-x^2-y^2}$ ii) $tanh\,2B = \frac{2y}{1+x^2+y^2}$	**5**	1	3
3	Prove that $log(1+e^{2i\theta}) = log(2cos\theta) + i\theta$.	**5**	1	3
Q. 3	**Attempt any two of the following**	**10**		
1	If $u = \log(1+x^n+y^n)$, then find the value of $\frac{\partial^2 u}{\partial x.\partial y} + \frac{\partial u}{\partial x}.\frac{\partial u}{\partial y}$	**5**	2	3
2	If $u = tan^{-1}\left(\frac{x^3-y^3}{x+y}\right)$ then find the value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ and prove that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = (1-4sin^2 u)\,sin2u$	**5**	2	3
3	If $z = x^2+y^2$, $x=cost$, $y= sint$, find $\frac{dz}{dt}$ at $t = \pi$.	**5**	2	3
Q. 4	**Attempt any two of the following**	**10**		
1	If $x = u(1-v)$, $y = u.v$ then Prove that, $J.J' = 1$	**5**	3	3
2	Find the possible percentage error in computing parallel resistance ' r ' of three resistances r_1, r_2, r_3 from the formula $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$, if r_1, r_2, r_3 are each in an error by 1%.	**5**	3	3
3	Find extreme values of $f(x,y) = x^3 + y^3 - 3axy$	**5**	3	3

Q. 5	**Attempt any two of the following**	**10**		
1	Solve: $\left(1 + x^2\right)dy = \left(e^{tan^{-1}x} - y\right)dx$	**5**	4	3
2	Water at temperature 100^0C cools in 10 min to 88^0C in a room temperature25^0C. Find the temperature of water after 20 minutes.	**5**	4	3
3	When a switch is closed, the current built up in an electric circuit is given by $L\frac{di}{dt} + Ri = E$. If L=640, R=250, E=500, and i=0 when t=0, show the current will approach 2 amps, when t→∞.	**5**	4	3
Q. 6	**Attempt any two of the following**	**10**		
1	A particle moves along the curve $x = t^3 + 1$, $y = t^2$, $z = 2t + 3$ where t is the time. Find the components of its velocity and acceleration at t =1 in the direction of the vector i + j + 3k.	**5**	5	3
2	Prove that the vector =(x+2y+az)i+(bx-3y-z)j+(4x+cy+2z)k , solenoidal and determine the constant a, b, c if the vector is irrotational .	**5**	5	3
3	Find the directional derivative of $\emptyset = x^2 y + y^2 z + z^2 x$ at (2,2,2,) in the direction of the normal to the surface $4 x^2 y + 2z^2 = 2$ at the point (2,-1,3).	**5**	5	3

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All UG Programs

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Engineering Mathematics-I (25UGS11004)

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Q. 1	**Multiple Choice Questions (MCQs) Each question carries 1 mark**	**Marks: 10** CO	BL
1	Let $u = f(x, y, z)$ be given function subject to $\emptyset(x, y, z) = 0$ then in Lagrange Method of undetermined multipliers, Lagrange function is given by $F(x, y, z, \lambda) =$ _____ (a) $f.\lambda\emptyset$ (b) $f/\lambda\emptyset$ (c) $f\lambda + f.\emptyset$ (d) $f + \lambda\emptyset$	3	1
2	The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 = \left(\frac{dy}{dx}\right)^{3/2}$ is ____ (a) 2, 6 (b) 6, 2 (c) 2, 3 (d) 3, 2	4	1
3	The orthogonal trajectories of the family of the circles $x^2 + y^2 = a^2$ where a is parameter are _____ (a) $y = mx^2$ (b) $y = mx$ (c) $y^2 = mx^2$ (d) none	4	1
4	If $\emptyset = 2x^3 + 3y^2 + 4z^2$ then $curl(grad\ \emptyset) =$_____ (a) $\nabla^2 u$ (b) ∇u (c) 1 (d) 0	5	1
5	Maximum value of directional derivative of scalar point function $\emptyset(x, y, z)$ is ___ a) $\lvert\emptyset\rvert$ b) $\lvert\nabla\emptyset\rvert$ c) $\nabla\emptyset$ d) None	5	1
6	$(sin\,\theta + icos\theta)^5 =$ _____ a) $sin\,5\theta - i\,cos5\theta$ b) $cos\,5\theta - i\,sin5\theta$ c) $cos\,4\theta + i\,sin4\theta$ d) None	1	1
7	If U=cosh(x+iy) then imaginary part of U is____ a) sinhx siny b) - sinx coshy c) sinx coshy d) -sinh(x) siny	1	1
8	If x = sin $(u + v)$ then $\frac{\partial x}{\partial v} =$ _____ a) $cos\,(u + v)$ b) $(u + v)$ c) $(u + v)$ d) $sin\,(u + v)$	2	1
9	If $z = tan^{-1}\left(\frac{x}{y}\right)$ then $\frac{\partial z}{\partial x} =$ ... a) $\frac{x}{x^2+y^2}$ b) $-\frac{x}{x^2+y^2}$ c) $\frac{y}{x^2+y^2}$ d) $-\frac{y}{x^2+y^2}$	2	1

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Engineering Mathematics-I (25UGS11004)

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Q. No.	Questions	Marks	CO	BL
Q. 2	**Attempt any two of the following**	**10**		
1	If n is positive integer, then prove that: $(-1+i\sqrt{3})^{3n} + (-1-i\sqrt{3})^{3n} = 2^{3n+1}$	**5**	1	3
2	If $tan(A+iB) = x+iy$, Prove that i) $tan\,2A = \frac{2x}{1-x^2-y^2}$ ii) $tanh\,2B = \frac{2y}{1+x^2+y^2}$	**5**	1	3
3	Prove that $log(1+e^{2i\theta}) = log(2cos\theta) + i\theta$.	**5**	1	3
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