

I B. Tech I Semester Supplementary Examinations, Oct/Nov - 2018
MATHEMATICS-I
 (Com. to All branches)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
 All Questions carry **Equal** Marks

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1. a) Solve $(1 + xy)xdy + (1 - xy)ydx = 0$. (8M)
 - b) Find the orthogonal trajectories of the family of circles $x^2 + (y - c)^2 = c^2$. (7M)
 2. a) Solve $(D^2 + 3D + 2)y = e^{-x} + \cos x$. (8M)
 - b) Solve $(D^2 - 2D + 1)y = xe^x \sin x$. (7M)
 3. a) If $x + y + z = u$, $y + z = uv$, $z = uvw$, then evaluate $\frac{\partial(x, y, z)}{\partial(u, v, w)}$. (8M)
 - b) Find Maclaurin's series expansion of the $f(x, y) = \sin^2 x$ and hence find the approximate value of $\sin^2 16^\circ$. (7M)
 4. Trace the curve $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$. (15M)
 5. a) Find the volume of the solid generated by the revolution of the area bounded by $y = x^2$ and $y = x$ about y -axis. (8M)
 - b) Prove that the length of the arc of a loop of the curve $9ay^2 = x(x - 3a)^2$ is $4\sqrt{3}a$. (7M)
 6. a) Evaluate $\iint_R xy dx dy$ where R is the region bounded by the x -axis, ordinate $x = 2a$ and the curve $x^2 = 4ay$. (8M)
 - b) By changing the order of integration, evaluate $\int_0^{\sqrt[3]{4-y}} \int_1^{\sqrt[3]{4-y}} (x + y) dx dy$. (7M)
 7. 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 $Q = (5, 0, 4)$. (8M)
 - b) Find $\text{div } \vec{f}$ where $\vec{f} = r^n \vec{r}$ and find n if it is solenoidal. (7M)
 8. Verify Stoke's theorem for $\vec{F} = (2x - y)\vec{i} - yz^2\vec{j} - y^2z\vec{k}$ over the upper half of surface of sphere $x^2 + y^2 + z^2 = 1$ bounded by the projection of the xy -plane. (15M)

