

Visvesvaraya National Institute of Technology, Nagpur
Department of Mathematics
II Semester B.Tech. Second Sessional Examination
Mathematics II (MAL 102)

Max Marks: 15

Date: 12 - 03 - 2014

Duration: 1 hour (2.30 PM - 3.30 PM)

Note: Answer any FIVE questions.

All questions carry equal marks.

Calculators are not permitted.

1. Solve the differential equation $r \sin \theta d\theta + (r^3 - 2r^2 \cos \theta + \cos \theta) dr = 0$.
2. Solve the differential equation $y'' + 5y' + 4y = 16x + 20e^x$.
3. Evaluate $\iint_R (x^2 + y^2) dx dy$ where R is the region in the first quadrant bounded by $x^2 - y^2 = a$, $x^2 - y^2 = b$, $2xy = c$, $2xy = d$, $0 < a < b$, $0 < c < d$.
4. Evaluate $\iint_R \frac{r dr d\theta}{\sqrt{a^2 + r^2}}$ over one loop of lemniscate $r^2 = a^2 \cos 2\theta$.
5. Find the center of gravity of a plate whose density $\rho(x, y)$ is constant and is bounded by the curves $y = x^2$ and $x + y = 2$.
6. Find the volume of the solid S bounded by the elliptic paraboloid $x^2 + 2y^2 + z = 16$, the planes $x = 2$, $y = 2$ and the three coordinate planes.