



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

I B.Tech II Sem Regular Examination, October/November 2020

MATHEMATICS-II (CIVIL, MECH, ECE)

Time: 2 Hours.

Max. Marks: 70

Note: 1. Answer any FIVE questions.

2. Each question carries 14 marks and may have a, b as sub questions.

- 1 a) Solve the differential equation $(hx + by + f)dy + (ax + hy + g)dx = 0$ 7M
 b) Solve $(y \log y)dx + (x - \log y)dy = 0$ 7M

- 2 Solve $p^3 - 2xyp + 4y^2 = 0$ 14M

- 3 a) Solve $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 10 \left(x + \frac{1}{x}\right)$ 7M
 b) Solve $(D^2 - 4D + 4)y = x^2 \sin x + e^{2x} + 3.$ 7M

- 4 Find the coordinates of the centre of gravity of the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$, the density being given $\rho = kxyz.$ 14M

- 5 a) Solve by the method of variation of parameters $(D^2 - 2D)y = e^x \sin x.$ 7M
 b) Show that $\int_0^1 dx \int_0^1 \frac{x-y}{(x+y)^3} dy \neq \int_0^1 dy \int_0^1 \frac{x-y}{(x+y)^3} dx$ 7M

- 6 If $\vec{r} = xi + yj + zk$. Prove that $\text{div}(r^n \vec{r}) = (n + 3)r^n$ 14M

- 7 a) Find the directional derivative of $\phi = xyz$ in the direction of i at the point $(1, 1, 1).$ 7M
 b) If $\vec{f} = 3x^2yz^2i + x^3z^2j + 2x^3yzk$. Show that $\int_C \vec{f} \cdot d\vec{r}$ is independent of the path of integration. Hence evaluate the integral when C is any path joining $(0, 0, 0)$ to $(1, 2, 3).$ 7M

- 8 Evaluate $\iint_S \vec{F} \cdot \vec{n} dS$ where $\vec{F} = 2x^2yi - y^2j + 4xz^2k$ and S is the closed surface of the region in the first octant by the cylinder $y^2 + z^2 = 9$ and the planes $x = 0, x = 2, y = 0, z = 0.$ 14M