

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
 MID TERM TEST – (SUMMER SEMESTER) EXAMINATION- JUNE 2018
 B.Tech I Semester (CS/IT/ECE/CE)

COURSE CODE: 10B11MA111

MAX. MARKS: 50

COURSE NAME: MATHEMATICS I

COURSE CREDITS: 4

MAX. TIME: 2 Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. (a) Show that the function $f(x, y) = 3x/\sqrt{x^2 + y^2}$ has no limit as $(x, y) \rightarrow (0, 0)$. [4]
 (b) Find the local extreme values of $f(x, y) = xy - x^2 - y^2 - 2x - 2y + 5$. [4]

2. Find the normal, unit normal and tangent plane to the sphere $x^2 + y^2 + z^2 - 14 = 0$ at the point $(1, 2, 3)$. [6]

3. Using total derivative formula find the total derivative du/dt and verify the result by direct substitution, if $u = x^2 + y^2 + z^2$ and $x = e^{2t}, y = e^{2t} \cos 3t, z = e^{2t} \sin 3t$ [6]

4. Use the Taylor's series expansion to expand $f(x, y) = e^x \log(1 + y)$ in powers of x and y (up to third degree terms). [6]

5. State the Euler's theorem for homogeneous functions, and verify it for the function

$$f(x, y) = x^2(x^2 - y^2)^3 / (x^2 + y^2)^3 \quad [6]$$

6. Draw a rough sketch of the region of integration and evaluate the double integral

$$\int_0^1 \int_0^{y^2} 3y^3 e^{xy} dx dy \quad [6]$$

7. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = (x - y)i + xj$ and C is the unit circle with center at the origin. [6]

8. (a) Evaluate $\text{curl}(\text{grad}(f))$ for $f = x^2 + y^2 + z^2$. [3]

- (b) Solve $\frac{dy}{dx} + 2y \tan x = \sin x$ [3]
