JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION- 2024
B.Tech-II Semester (BT/BI)

COURSE CODE (CREDITS): 18B11MA212 (04) MAX. MARKS: 25
COURSE NAME: BASIC MATHEMATICS-II
COURSE INSTRUCTORS: MDS MAX. TIME: 1 Hour 30 Minutes

Note: ***(a)*** *All questions are compulsory.*
(b)Marks are indicated against each question in square brackets.
(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. (a) Determine the convergence or divergence of the series **[2.5+2.5] (CO-1)**

$$\sum_{n=1}^{\infty} \frac{5n+3}{n^{\frac{3}{2}}(\sqrt{n}+1)}.$$

(b) Test the convergence of the series

$$\sum_{n=1}^{\infty} \left(1+\frac{1}{\sqrt{n}}\right)^{-n^{3/2}}.$$

Q2. Use the chain rule, express $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ in terms of r and s if **[4] (CO-2)**

$$w = x^2 + y^2 + z^2, \quad x = r + s, \quad y = r - s, \quad z = 2r^2.$$

Q3. Find the normal vector to the surface $f(x, y, z) = \ln(x + 2y^2 + z^2)$ at the point (1,1,2). **[3] (CO-2)**

Q4. Compute $div\left(curl\left(\vec{V}\right)\right)$, where $\vec{V} = (x^2 + yz)\hat{\imath} + (y^2 + zx)\hat{\jmath} + (z^2 + xy)\hat{k}$. **[3] (CO-2)**

Q5. If $u = \cos^{-1}\left(\frac{x^3+y^3}{x+y}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = -2\cot u$. **[3] (CO-2)**

Q6. Evaluate the line integral $\int_C \vec{V} \cdot d\vec{r}$, of $\vec{V} = (x)\hat{\imath} + (\sin y)\hat{\jmath} + \hat{k}$ over the curve C, whose parametric representation is given by $x = t^2,\ y = t,\ z = 2t,\ 0 \le t \le 1$. **[3] (CO-2)**

Q7. (a) Write the order and degree of the differential $\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{5/2} = \frac{d^3y}{dx^3}$.

(b) Solve the differential equation $\frac{dy}{dx} - \frac{2}{x}y = x^3 + 6x + 2$ **[1+3] (CO-3)**