JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

T-2, EXAMINATION- 2022

B.Tech. II Semester(BI/BT)

COURSE CODE (CREDITS): 18B11MA212 (04) MAX. MARKS: 25

COURSE NAME: BASIC MATHEMATICS-II

COURSE INSTRUCTORS: Dr. MANDEEP SINGH MAX. TIME: 1:30 Hrs.

***Note:** All questions are compulsory. Marks are indicated against each question in square brackets.*

Quest.(1) Investigate the convergence of the following series

(a) $\frac{1}{\sqrt{2}+\sqrt{1}}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+\cdots+\cdots$

(b) $\sum_{n=1}^{\infty}\frac{x^n}{(n+1)\sqrt{n}}$ **(CO-1) [2+3]**

Quest. (2) (a) Examine the convergence of the series

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

(b) Test the series

$$\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^2+2n+1}$$

for the absolute convergence and conditionally convergent. **(CO-1) [2+2]**

Quest. (3) (a) Determine the limit (if exist) of the following function as $(x,y)\to(0,0)$

$$f(x,y)=\frac{x^2y}{x^3+y^3}.$$

(b) By using chain rule, express $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ in terms of "r" and "s" if

$$w=x^2+y^2+xy+9,\quad x=r-s,\quad y=r+s$$

(CO-2) [2+3]

Quest(4) If $u=\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then find the value of $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$ =? **(CO-2) [3]**

Quest.(5) Expand $f(x,y)=21+x-20y+4x^2+xy+6y^2$ in powers of $(x+1)$ and $(y-2)$, by using Taylor's series. **(CO-2) [3]**

Quest.(6) Find a unit normal vector to the surface $x^2 + 2y^2 + z^2 = 4$ at the point (1,1,1).

(CO-2) [2]

Quest.(7) A person on a hang glider is spiraling upward due to rapidly rising air on a path having position vector $\overrightarrow{r(t)} = (3\cos t)\hat{\imath} + (3\sin t)\hat{\jmath} + t^2\hat{k}$, where $0 \leq t \leq 4\pi$. Find

(a) the velocity and acceleration vectors,
(b) the glider's speed at any time t,
(c) the times, if any, when the glider's acceleration is orthogonal to its velocity.

(CO-2) [3]