JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

T-3, EXAMINATION- 2022

B. Tech. II Semester (BI/BT)

COURSE CODE (CREDITS): 18B11MA212 (04)　　　　　MAX. MARKS: 35

COURSE NAME: BASIC MATHEMATICS-II

COURSE INSTRUCTORS:　Dr. MANDEEP SINGH　　　　MAX. TIME: 2:00 Hrs.

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Scientific calculator is allowed.

Quest.(1) Examine the convergence of the following series　　　　(CO-1)　[2+2]

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

(b)　$\frac{1}{(6)^2} - \frac{2}{(11)^2} + \frac{3}{(16)^2} - \frac{4}{(21)^2} + \frac{5}{(26)^2} - \cdots + \cdots$

Quest. (2) (a) Show that the vector field defined by the vector function $\vec{V} = xyz(yz\,\hat{\imath} + xz\,\hat{\jmath} + xy\,\hat{k})$ is conservative.

(b) Find $grad(f)$ and also compute the directional derivative of

$$f(x,y,z) = xy^2 + 4xyz + z^2$$

at the point $(1,2,3)$ in the direction of $3\,\hat{\imath} + 4\,\hat{\jmath} - 5\,\hat{k}$.　　　　(CO-2) [3+3]

Quest. (3) (a) Solve the following differential equation　　　　(CO-3) [3]

$$(1 + x^2)\frac{dy}{dx} + 2xy - 4x^2 = 0.$$

Quest.(4) (a) Solve the following differential equation　　　　(CO-4) [4+4]

$$x^2 \frac{d^2y}{dx^2} + 2x \frac{dy}{dx} - 20y = (x + 1)^2$$

(b) Solve the following differential equation

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2 + e^{2x} + \cos 2x$$

Quest.(5) Draw the histogram (on your answer sheet) from the following frequency distribution and also calculate the standard deviation by using Step-Deviation method　　　　(CO-5) [5]

Class Intervals	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85
Frequency	7	8	12	26	32	42	42	15	17	9

Quest.(6) Find the mode and median for the following frequency distribution   **(CO-5) [4]**

Class	0 - 6	6 – 12	12 - 18	18 - 24	24 - 30	30 - 36	36 - 42	42 – 48
Frequency	5	11	25	20	15	18	12	6

Quest. (7) (a) Using Simpson's $\frac{1}{3}$rd rule, estimate $\int_1^7 f(t)dt,$ where the table below shows the temperature $f(t)$ as a function of time: **(CO-6) [2.5+2.5]**

t	1	2	3	4	5	6	7
$f(t)$	81	75	80	83	78	70	60

(b) Using Newton's forward formula, calculate the value of $f(0.25)$ if

x	0.1	0.2	0.3	0.4	0.5
$f(x)$	1.40	1.56	1.76	2.00	2.28