R22 Regulation *Subject code:4B2AM*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech II Semester Regular Examinations, September 2023

Statistical Methods and Vector Calculus

(Common to CSE, CSE(AI&ML), CSE(DS) and IT)

Maximum Marks: 60 Date:16.09.2023 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x1M=10 Marks)

1. a Write the formula for harmonic mean?
   b Calculate mode of 23,56,7,89,90,23,23,12.
   c Write the formula for Mean deviation?
   d Write the formula for Bowley's coefficient of skewness?
   e Write about periodic changes in time series?
   f Write the mathematical models in Time series?
   g Define gradient of a scalar point function.
   h Prove that curl grad $\emptyset = 0$.
   i Define line integral.
   j State Gauss divergence theorem.

Part-B

Answer All the following questions. (5X10M=50Marks)

2 Find Mean and Median for the following data: [10]

Class intervals	0-10	10-20	20-30	30-40	40-50
Frequency	3	5	4	8	2

OR

3 A) Explain measure of central tendency. [5]
B) Find Geometric mean to the following data. [5]

Classes	0-100	100-200	200-300	300-400	400-500	500-600	600-700
frequency	23	6	67	3	5	9	10

4 Calculate Bowley's coefficient of skewness to the following data.[10]

x	0	1	2	3	4	5	6	7	8
f	1	8	28	56	70	56	28	8	1

OR

5 Examine which group is more consistent from the following data. [10]

Classes	0-5	5-10	10-15	15-20	20-25	25-30	30-40
Group A (Frequency)	2	10	31	3	10	12	11
Group B (Frequency)	3	12	30	4	5	13	10

6 Calculate the three and five year moving averages of the following data : [10]

Year:	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Production ('000 tons)	18	19	20	22	20	19	22	24	25	24	2526

OR

7 Apply the method of semi-averages for determining trend of the following data and estimate the value for 2000. [10]

Years	1993	1994	1995	1996	1997	1998
Sales	20	24	22	30	28	32

8 a) Find 'a' such that $(3x - 2y + z)\bar{\imath} + (4x + ay - z)\bar{\jmath} + (x - y + 2z)\bar{k}$ is solenoidal. [5]
b) Find a,b,c if $(x + ay + az)\bar{\imath} + (bx + 2y - z)\bar{\jmath} + (-x + cy + 2z)\bar{k}$ is irrotational. [5]

OR

9 a) Show that $\bar{f} = yz\hat{\imath} + zx\hat{\jmath} + xy\hat{k}$ is irrotational and find the scalar potential φ such that $\bar{f} = \nabla\varphi$. [5]
b) Show that $div\left(\frac{\bar{r}}{r}\right) = \frac{2}{r}$, where $\bar{r} = \hat{\imath}x + \hat{\jmath}y + \hat{k}z$ and $|\bar{r}| = r$. [5]

10 a) If $\vec{F} = 3xy\hat{\imath} - y^2\hat{\jmath}$, evaluate $\int_c \vec{F}.d\vec{r}$ where C is the curve $y = 2x^2$ in the xy-plane from $(0,0)$ to $(1,2)$. [5]
b) Evaluate by Green's theorem $\oint(y - sinx)dx + cosx\, dy$, where C is the area enclosed by the lines $y = 0, x = \frac{\pi}{2}, \pi y = 2x$. [5]

OR

11 Verify Gauss divergence theorem for $\vec{F} = (x^3 - yz)\hat{\imath} - 2x^2y\hat{\jmath} + z\hat{k}$ taken over the surface of the cube bounded by the planes $x = y = z = a$ and coordinate planes. [10]