ENGINEERING MATHEMATICS

UNIT-3 : *Statistical Techniques – I*

- *Overview of Measures of central tendency*
- *Moments*
- *Skewness*
- *Kurtosis*
- *Curve Fitting*
  - *(i) Method of least square*
  - *(ii) Fitting of straight lines*
  - *(iii) Fitting of second degree parabola*
  - *(iv) Exponential curve*
- *Correlation and Rank correlation*
- *Regression Analysis : Regression lines of y on x and x on y.*

ENGINEERING MATHEMATICS

UNIT-3 : *Statistical Techniques - I*

Today's Target

- ***Overview of Measures of central tendency***
- PYQ
- DPP

Measure of central Tendency

(An average is a measure of central tendency of data)

There are five types of averages in common use

1. Arithmetic Mean OR Mean
2. Median
3. Mode
4. Geometric Mean
5. Harmonic Mean

3 (Median) = Mode + 2 (Mean)



MEAN

Methods to find Mean

(i) Direct Method

(ii) Shortcut Method or Assumed mean method

(iii) Step Deviation method

For Individual series (Where frequency are not given)

Let $x_1, x_2, x_3, \ldots\ldots\ x_n$ are n observation

Direct Method

$$\text{Mean} = \frac{\text{Sum of Observations}}{\text{Number of Observations}}$$

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \ldots\ldots + x_n}{n}$$

$$\boxed{\bar{x} = \frac{\Sigma x}{n}}$$

$$\boxed{\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}}$$

Q.1: *The weights (in Kilogram) of 5 persons are 67, 65, 71, 57 and 45. Find the mean of their weights.*

$x_1 = 67$

$x_2 = 65$

$x_3 = 71$

$x_4 = 57$

$x_5 = 45$

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{67 + 65 + 71 + 57 + 45}{5}$$

$$\boxed{\bar{x} = 61 \text{ kg}}$$

For Discrete Series (Where frequency is given)

Let $x_1, x_2, x_3, \ldots\ldots x_n$ are n observation with respective frequencies $f_1, f_2, f_3, \ldots\ldots f_n$.

Method used to find Mean

(i) Direct Method

$$\bar{x} = \frac{f_1 x_1 + f_2 x_2 + \ldots\ldots + f_n x_n}{f_1 + f_2 + f_3, + \ldots\ldots + f_n}$$

$$\bar{x} = \frac{\Sigma f x}{\Sigma f}$$

Also $\Sigma f = N$

$$\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum f_i}$$

(ii) Shortcut Method or Assumed mean method

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

Where A = Assume Mean

Also $\Sigma f = N$

Deviation$(d) = x - A$

(iii) Step Deviation method

$$\bar{x} = A + h \times \frac{\Sigma fu}{\Sigma f}$$

Where A = Assume mean

h = common factor

Also $\Sigma f = N$

$$u = \frac{x - A}{h}$$

Q.2. *Find the mean of the following frequency distribution of marks in a test in mathematics.*

Marks	(x)	10	20	30	40	50	60	70	80
No. of students	(f)	3	6	10	12	9	6	2	2

MARKS(x)	Number of students (f)	fx
10	3	30
20	6	120
30	10	300
40	12	480
50	9	450
60	6	360
70	2	140
80	2	160
	$\Sigma f = 50$	$\Sigma fx = 2040$

By Direct Method

$$\bar{x} = \frac{\Sigma fx}{\Sigma f}$$

$$\bar{x} = \frac{2040}{50}$$

$$\bar{x} = 40.8$$

MARKS (x)	Number of students (f)	$d = x - A$	fd
10	3	−30	−90
20	6	−20	−120
30	10	−10	−100
A → 40	12	0	0
50	9	10	90
60	6	20	120
70	2	30	60
80	2	40	80
	$\Sigma f = 50$		$\Sigma fd = 40$

By Assume Mean Method

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

$$\bar{x} = 40 + \frac{40}{50}$$

$$\bar{x} = 40 + 0.8$$

$$\boxed{\bar{x} = 40.8}$$

x	f	$x - A$	$u = \frac{x-A}{h}$	fu
10	3	−30	−3	−9
20	6	−20	−2	−12
30	10	−10	−1	−10
40 (A)	12	0	0	0
50	9	10	1	9
60	6	20	2	12
70	2	30	3	6
80	2	40	4	8
	$\Sigma f = 50$			$\Sigma fu = 4$

By Step Deviation Method

$$\bar{x} = A + h \times \frac{\Sigma fu}{\Sigma f}$$

$$\bar{x} = 40 + 10 \times \frac{4}{50}$$

$$\bar{x} = 40 + 0.8$$

$$\boxed{\bar{x} = 40.8}$$

For Continuous series (Where frequency and class intervals are given)

Let $x_1, x_2, x_3, \ldots\ldots x_n$ are n observation with respective frequencies $f_1, f_2, f_3, \ldots\ldots f_n$.

Note : - $$x = \frac{\text{Lower limit of class interval} + \text{Upper limit of class interval}}{2}$$

Mid value

Method used to find Mean

(i) Direct Method

$$\bar{x} = \frac{f_1 x_1 + f_2 x_2 + \ldots\ldots + f_n x_n}{f_1 + f_2 + f_3, + \ldots\ldots + f_n}$$

$$\bar{x} = \frac{\Sigma f x}{\Sigma f}$$

Also $\Sigma f = N$

(i) Shortcut Method or Assumed mean method

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

Where A = Assume Mean

Also $\Sigma f = N$

(Deviation) $d = x - A$

(iii) Step Deviation method

$$\bar{x} = A + h \times \frac{\Sigma fu}{\Sigma f}$$

Where h = Width of class interval

Also $\Sigma f = N$

$$u = \frac{x - A}{h}$$

Q.3. *Find the mean of the following frequency distribution*

Class	5-15	15-25	25-35	35-45	45-55	55-65
frequency	10	20	25	20	15	10

CLASS	Frequency (f)	Mid value (x)	fx
5-15	10	10	100
15-25	20	20	400
25-35	25	30	750
35-45	20	40	800
45-55	15	50	750
55-65	10	60	600
	$\Sigma f = 100$		$\Sigma fx = 3400$

By Direct Method

$$\bar{x} = \frac{\Sigma fx}{\Sigma f}$$

$$\bar{x} = \frac{3400}{100}$$

$$\bar{x} = 34$$

CLASS	Frequency (f)	Mid value (x)	$d = x - A$	fd
5-15	10	10	-20	-200
15-25	20	20	-10	-200
25-35	25	30 (A)	0	0
35-45	20	40	10	200
45-55	15	50	20	300
55-65	10	60	30	300
	$\Sigma f = 100$			$\Sigma fd = 400$

By Assume Mean Method

$$\bar{x} = A + \frac{\Sigma fd}{\Sigma f}$$

$$\bar{x} = 30 + \frac{400}{100}$$

$$\bar{x} = 34$$

CLASS	Frequency (f)	Mid value (x)	$u = \frac{x-A}{h}$	fu
5-15	10	10	-2	-20
15-25	20	20	-1	-20
25-35	25	30 (A)	0	0
35-45	20	40	1	20
45-55	15	50	2	30
55-65	10	60	3	30
	$\Sigma f = 100$			$\Sigma fu = 40$

By Step-Deviation Method

$$\bar{x} = A + h \times \frac{\Sigma fu}{\Sigma f}$$

$$\bar{x} = 30 + 10 \times \frac{40}{100}$$

$$\boxed{\bar{x} = 34}$$

DPP- 1

Topic : *Overview of Measures of central tendency*

Q.1. Find the mean for the following individual series

x	3	6	8	10	18

Q. 2. $Find\ the\ mean\ of\ the\ following\ frequency\ distribution$

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

Q.3. $Find\ the\ mean\ of\ the\ following\ frequency\ distribution$

$Marks$	0-10	10-20	20-30	30-40	40-50
$No.\ of\ Students$	5	10	40	20	25

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Thank You

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