

**21MNP1C4L****M.Tech. I Semester Degree Examination, April/May - 2023****MINERAL PROCESSING****MPSC-1.5 : Applied Mathematics & Experimental Design**

Time : 3 Hours

Maximum Marks : 70

**Note :** Answer **any five** of the following questions.

1. (a) Solve :  $x^4 - 6x^3 + 12x^2 - 10x + 3 = 0$  by synthetic division. **4+5+5**  
 (b) Solve :  $(D^3 - 9D^2 + 23D - 15)y = 0$   
 (c) Solve graphically :  $2x + 3y = 2$ ,  $x - 2y = 8$

2. (a) Use the Remainder theorem to find remainder when  $2x^3 + 3x^2 - 5x - 6$  is divided by  $(2x - 1)$ . **4+5+5**  
 (b) Find the variance and standard deviation for the following data.

$x_i$	6	10	14	18	24	28	30
$f_i$	2	4	7	12	8	4	3

- (c) The daily wages of 80 workers in a project are given below.

<b>Wages in (₹)</b>	400-450	450-500	500-550	550-600	600-650	650-700	700-750
<b>No. of worker's</b>	2	6	12	18	24	13	5

Use a graph paper to draw an ogive for the above distribution (use a scale of 2 cm = ₹ 50 on  $x$ -axis and 2 cm = 10 workers on  $y$ -axis). Use your ogive to estimate.

- (i) The median wages of the workers  
 (ii) The lower quartile wage of workers  
 (iii) The number of workers who earn more than ₹ 625 daily

3. (a) Solve by method of cross-multiplication  $2x - 5y + 8 = 0$ ,  $x + 7 = 4y$  4+5+5

- (b) The weight of 25 students of a class are given in the following table :

<b>Weight (in kg)</b>	65	66	67	68	69
<b>Number of Students</b>	8	6	4	4	3

Using short-cut method, find the mean weight

- (c) Solve :  $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 2x^2$

4. (a) Solve by using quadratic formula  $12x^2 + 7x - 10 = 0$  4+5+5

- (b) Solve :  $2 \frac{d^2y}{dx^2} + 5 \frac{dy}{dx} + 2y = 5 + 2x$

- (c) Draw histogram for the following

<b>Class interval</b>	11-20	21-30	31-40	41-50	51-60
<b>Frequency</b>	5	8	13	10	6

5. (a) Find the mean deviation about the mean for the data : 4+5+5

$x_i$	5	10	15	20	25
$f_i$	7	4	6	3	5

- (b) The following table shows the frequency distribution of height of 50 boys.

<b>Height (cm)</b>	120	121	122	123	124
<b>Frequency</b>	5	8	18	10	9

Find the median and mode of height

- (c) In the following table  $\sum f = 90$  and mean = 7.5. Find the missing frequency  $f_1$  and  $f_2$ .

<b>Variable</b>	5	6	7	8	9	10	11	12
<b>Frequency</b>	20	17	$f_1$	10	8	$f_2$	7	6



6. (a) Find the lower quartile, upper quartile and inter quartile range for the data : **4+5+5**  
 9, 11, 15, 19, 17, 13, 7.
- (b) Construct a frequency distribution table for the following data with class size 3[Exclusive form] 18, 12, 7, 6, 11, 15, 21, 9, 8, 13, 15, 17, 22, 19, 14, 21, 23, 8, 12, 17, 15, 6, 18, 23, 22, 16, 9, 21, 11, 16.
- (c) Solve :  $L[\cos 2t \times \cos 3t]$
7. (a) Solve :  $L\left[\int_0^t \sinh 2t \, dt\right]$  **4+5+5**
- (b) Solve :  $L[\cos^3 at]$
- (c) Solve :  $(4D^2 + 12D + 9)y = 99x^2 + 4e^{-3x/2}$
8. (a) Solve by Elimination method : **4+5+5**  
 $8x - 3y = 12$   
 $5x = 2y + 7$
- (b) Solve :  $L^{-1}\left(\frac{1}{S(S+2)}\right)$
- (c) Explain about YATE's algorithm for ANOVA  
 (Analysis of variance)

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