**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86**
**(For candidates admitted from the academic year 2025 – 2026 and thereafter)**

**B.COM. END SEMESTER EXAMINATION, APRIL 2026**
**HONOURS**
**SECOND SEMESTER**

**COURSE : ELECTIVE**
**PAPER : MATHEMATICS FOR COMMERCE**
**SUBJECT CODE :25BH/ME/MC23**
**TIME : 3 HOURS** **MAX. MARKS: 100**

<table>
<tr><td></td><td>SECTION A</td><td></td><td></td></tr>
<tr><td>Q. No.</td><td>Answer any TWO questions: (2 × 5 = 10)</td><td>CO</td><td>KL</td></tr>
<tr><td>1.</td><td>Write about matrix algebra and it’s the advantages.</td><td>1</td><td>1</td></tr>
<tr><td>2.</td><td>State the formula for total revenue and demand function.</td><td>1</td><td>1</td></tr>
<tr><td>3.</td><td>Define slack and surplus variables in a general L.P.P.</td><td>1</td><td>1</td></tr>
<tr><td></td><td>SECTION B</td><td></td><td></td></tr>
<tr><td>Q. No.</td><td>Answer any TWO questions : (2 × 5 = 10)</td><td>CO</td><td>KL</td></tr>
<tr><td>4.</td><td>Find the total cost of production with the marginal cost $MC = 4 + 5x^2 + \frac{3}{2}e^{-x}$ where x is the quantity produced, provided fixed cost is Rs. 6 lakhs.</td><td>2</td><td>2</td></tr>
<tr><td>5.</td><td>Find the Newton’s forward difference table for the following data:
<table>
<tr><td>$x$</td><td>50</td><td>60</td><td>70</td><td>80</td><td>90</td></tr>
<tr><td>$y$</td><td>19.96</td><td>36.65</td><td>58.81</td><td>77.21</td><td>94.61</td></tr>
</table></td><td>2</td><td>2</td></tr>
<tr><td>6.</td><td>Reduce the following L.P.P to standard form:<br>$Minimize\ Z = x_1 + 3x_2$<br>subject to $2x_1 + 3x_2 \leq 2$<br>$x_1 + x_2 \geq -2$<br>$3x_1 + x_2 \leq -3$ and $x_1, x_2 \geq 0$</td><td>2</td><td>2</td></tr>
<tr><td></td><td>SECTION C</td><td></td><td></td></tr>
<tr><td>Q. No.</td><td>Answer any TWO questions: (2 × 10 = 20)</td><td>CO</td><td>KL</td></tr>
<tr><td>7.</td><td>The ABC Co. Ltd. has approximated the marginal revenue function for one of its products by $MR = 20x - 2x^2$. The marginal cost function is approximated by $MC = 81 - 16x + x^2$. Determine the profit-maximizing output and the total profit at the optimal output.</td><td>3</td><td>3</td></tr>
<tr><td>8.</td><td>Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with $h = 0.2$. Hence determine the value of $\pi$.</td><td>3</td><td>3</td></tr>
<tr><td>9.</td><td>Find the optimum sequence for the following sequencing problem:
<table>
<tr><td>Jobs:</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td></tr>
<tr><td>$M_1$</td><td>14</td><td>26</td><td>17</td><td>11</td><td>9</td><td>26</td><td>18</td><td>15</td></tr>
<tr><td>$M_2$</td><td>21</td><td>15</td><td>16</td><td>21</td><td>22</td><td>12</td><td>13</td><td>25</td></tr>
</table>
Find also the minimum total elapsed time and idle times on the machines $M_1$ and $M_2$.</td><td>3</td><td>3</td></tr>
</table>

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**SECTION D**

**Q. No. Answer any TWO questions: ($2 \times 20 = 40$)** **CO** **KL**

10. A firm produces three products $P_1$, $P_2$ and $P_3$ processed on four machines $M_1, M_2, M_3$ and $M_4$. $M_1$ can process 25 units of $P_1$ or 50 units of $P_2$ or 75 units of $P_3$ per hour. $M_2$ can process 50 units of any product per hour. $M_3$ can process 50 or 25 or 100 units per hour and machine $M_4$ can process 50 or 40 or 50 units per hour of $P_1$, $P_2$ and $P_3$ respectively. The processing hours available on the machines $M_1, M_2, M_3$ and $M_4$ are 12,12,13 and 13 respectively. Using matrix methods, find how many units of three products can be produced with the available time fully used? — CO: 4, KL: 4

11. (i) Find the first derivative of $y = log_e x$ at $x = 550$ using Newton's backward formula — CO: 4, KL: 4

| $x$ | 500 | 510 | 520 | 530 | 540 | 550 |
|---|---|---|---|---|---|---|
| $y = log_e x$ | 6.2146 | 6.2344 | 6.2538 | 6.2729 | 6.2916 | 6.3099 |

(ii) Calculate the total time consumed and the idle time for the 3 machines whose durations are given as follows:

| Jobs | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Printing | 40 | 90 | 80 | 60 | 50 |
| Binding | 50 | 60 | 20 | 30 | 40 |
| Finishing | 80 | 100 | 60 | 70 | 110 |

(8+12)

12. (i) If the marginal revenue function is $MR = \frac{ab}{(x-b)^2} - c$, show that $p = \frac{a}{b-x} - c$ is the demand law. — CO: 4, KL: 4

(ii) Use simplex method to solve the Linear Programming Problem

$$Maximize\ Z = 4x_1 + 10x_2$$
subject to $2x_1 + x_2 \leq 50$
$2x_1 + 5x_2 \leq 100$
$2x_1 + 3x_2 \leq 90$ and $x_1, x_2 \geq 0$.

(8+12)

**SECTION E**

**Q. No. Answer any TWO questions : ($2 \times 10 = 20$)** **CO** **KL**

13. A firm produces three products chairs, tables and cupboards requiring the raw materials timber, nails and varnish The per unit requirement of each product for each material is as follows: — CO: 5, KL: 5

| **Product** | **Timber (c.ft.)** | **Nails (dozen)** | **Varnish (litres)** |
|---|---|---|---|
| Chair | 2 | 3 | 1 |
| Table | 4 | 2 | 5 |
| Cupboard | 2 | 4 | 2 |

Using matrix notations, find
**(i)** the per unit cost of production of each product if the per unit cost of materials are Rs.5, Rs.10 and Rs.5 respectively and
**(ii)** the total cost of production if the firm produces 200 units of each product.

14. Given $u_0 = 5, u_1 = 15, u_2 = 57$ and $\frac{du}{dx} = 4$ at $x = 0$ and 72 at $x = 2$. Find $\Delta^3 u_0$ and $\Delta^4 u_0$. — CO: 5, KL: 5

15. Use graphical method to find the minimum elapsed time needed to process the following jobs on 4 machines *A, B, C, D* given the processing times and the sequence. — CO: 5, KL: 5

| | **Sequence:** | **A** | **B** | **C** | **D** |
|---|---|---|---|---|---|
| Job 1: | Time (in hrs): | 2 | 3 | 5 | 2 |
| | Sequence: | D | C | A | B |
| Job 2: | Time (in hrs): | 6 | 2 | 3 | 1 |

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