Marking Scheme (Set-1)

<table>
<tr><th>Q</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1</td><td>b</td><td>1</td></tr>
<tr><td>2</td><td>d</td><td>1</td></tr>
<tr><td>3</td><td>a</td><td>1</td></tr>
<tr><td>4</td><td>c</td><td>1</td></tr>
<tr><td>5</td><td>b</td><td>1</td></tr>
<tr><td>6</td><td>d</td><td>1</td></tr>
<tr><td>7</td><td>a</td><td>1</td></tr>
<tr><td>8</td><td>b</td><td>1</td></tr>
<tr><td>9</td><td>b</td><td>1</td></tr>
<tr><td>10</td><td>c</td><td>1</td></tr>
<tr><td>11</td><td>b</td><td>1</td></tr>
<tr><td>12</td><td>d</td><td>1</td></tr>
<tr><td>13</td><td>a</td><td>1</td></tr>
<tr><td>14</td><td>a</td><td>1</td></tr>
<tr><td>15</td><td>d</td><td>1</td></tr>
<tr><td>16</td><td>c</td><td>1</td></tr>
<tr><td>17</td><td>c</td><td>1</td></tr>
<tr><td>18</td><td>a</td><td>1</td></tr>
<tr><td>19</td><td>b</td><td>1</td></tr>
<tr><td>20</td><td>c</td><td>1</td></tr>
<tr><td>21</td><td>Variable sepration
Correct integration
Final Answer
OR
Variable sepration
Correct integration
Final Answer</td><td>½
1
½

½
1
½</td></tr>
<tr><td>22</td><td><table><tr><td>X(number of defective bulbs)</td><td>X=0</td><td>X=1</td><td>X=2</td></tr><tr><td>P(x)</td><td>28/45</td><td>16/45</td><td>1/45</td></tr></table></td><td>1
1</td></tr>
<tr><td>23</td><td>Here R=2500 , $i = \frac{3}{100}$
P=R+$\frac{R}{i}$
P=2500 + $\frac{2500}{0.03}$
=2500 + 83333.33
= ₹ 85833.33</td><td>½
½

1</td></tr>
<tr><td>24</td><td>Rate of return =$\left(\frac{60000-50000}{50000}\right)X100 = 20\%$
OR
P= 2,00,000
I= 2,00,000$\times$ 5 $\times \frac{10}{100} = 1,00,000$
EMI= $\frac{P+I}{n} = \frac{2,00,000+1,00,000}{12\times5}$ =₹ 5000</td><td>2

1

1</td></tr>
<tr><td>25</td><td><table><tr><td>Corner points</td><td>Z = 3x+4y</td></tr><tr><td>A(4,0)</td><td>3(4)+ 4(0)=12</td></tr></table></td><td>1</td></tr>
</table>

<table>
<tr>
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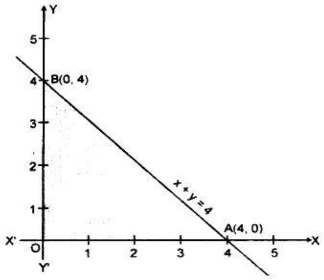
<table>
<tr><td>B(0,4)</td><td>3(0)+4(4)=16
(MAX . value)</td></tr>
<tr><td>O(0,0)</td><td>3(0)+4(0)=0</td></tr>
</table>



The line x + y = 4 meets the coordinate axis at A(4, 0) and B(0, 4).
It is clear from the table, the objective function has maximum value at point B(0, 4). So, the required solution of the given LPP, is x = 0, y = 4 and the maximum value is Z = 16.
</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>

$\frac{24}{18-x} - \frac{24}{18+x} = 1$

$x^2 + 48x - 324 = 0$

$(x + 54)(x - 6) = 0$

x=6 (Speed of the stream cannot be negative)

speed of stream is 6km/hr.............
</td>
<td>1
1
1</td>
</tr>
<tr>
<td>27</td>
<td>
<table>
<tr><td>customer</td><td>notebooks</td><td>pens</td><td>pencils</td></tr>
<tr><td>A buys</td><td>12</td><td>5</td><td>6</td></tr>
<tr><td>B buys</td><td>10</td><td>6</td><td>7</td></tr>
<tr><td>C buys</td><td>11</td><td>13</td><td>8</td></tr>
</table>

$$\begin{bmatrix} 12 & 5 & 6 \\ 10 & 6 & 7 \\ 11 & 13 & 8 \end{bmatrix} \begin{bmatrix} 0.40 \\ 1.25 \\ 0.35 \end{bmatrix} 12 = \begin{bmatrix} 4.8 + 6.25 + 2.1 \\ 4 + 7.5 + 2.45 \\ 4.4 + 16.25 + 2.8 \end{bmatrix} 12$$

$$\begin{bmatrix} 13.15 \\ 13.95 \\ 23.45 \end{bmatrix} 12 = \begin{bmatrix} 157.8 \\ 167.4 \\ 281.4 \end{bmatrix}$$

$$\begin{bmatrix} A \\ \boldsymbol{B} \\ C \end{bmatrix} = Rs \begin{bmatrix} 157.8 \\ 167.4 \\ 281.4 \end{bmatrix}$$

OR

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$$

[Applying $R_1 \to R_1 + R_2 + R_3$]

$$= \begin{vmatrix} a+b+c & a+b+c & a+b+c \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$$

[Taking $(a+b+c)$ common from the first row]

$$= (a+b+c) \begin{vmatrix} 1 & 1 & 1 \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$$

[Applying $C_1 \to C_1 - C_3$ and $C_2 \to C_2 - C_3$]

$$= (a+b+c) \begin{vmatrix} 0 & 0 & 1 \\ 0 & -(a+b+c) & 2b \\ a+b+c & a+b+c & c-a-b \end{vmatrix}$$

Expanding along R_1,

$= (a+b+c)\,[1 \times 0 + (a+b+c)^2] = (a+b+c)^3$
</td>
<td>1
1
1

1+1+1</td>
</tr>
<tr>
<td>28</td>
<td>

$y = 2\,x^3 - 15x^2 + 36\,x - 21$
</td>
<td>½</td>
</tr>
</table>

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<tr>
<td></td>
<td>$$\frac{dy}{dx} = 6x^2 - 30x + 36$$
As given curve is parallel to x –axis therefore $\frac{dy}{dx} = 6x^2 - 30x + 36$ =0
⟹x=3,2
Putting value of x in given curve , y=6,7 respectively
Passing points are (3,6) and (2,7)
∴ equation of tangent is given by y – y1 = m(tangent)(x – x1)
y – 6 = 0(x – 3) or y – 7 = 0(x – 2)
y = 6 or y=7</td>
<td>½
1
1</td>
</tr>
<tr>
<td>29</td>
<td>$$\frac{(2x+1)}{(x+1)(x-2)} = \frac{A}{x+1} + \frac{B}{x-2}$$
On solving A=1/3 , B=5/3
Therefore $\int \frac{(2x+1)}{(x+1)(x-2)}\, dx = \frac{1}{3}\int \frac{1}{(x+1)}\, dx + \frac{5}{3}\int \frac{1}{(x-2)}\, dx$
$$\int \frac{(2x+1)}{(x+1)(x-2)}\, dx = \frac{1}{3}\log|x+1| + \frac{5}{3}\log|x-2| + c$$</td>
<td>1
1
1</td>
</tr>
<tr>
<td>30</td>
<td>. Null Hypothesis - $H_0:\mu_x=\mu_y$
Alternative Hypothesis - $H_1:\mu_x\neq\mu_y$
Test Statistic : Under H_0 the test statistic is [c.f.(19.22)]: $t=\frac{\bar{d}}{S/\sqrt{n}}\sim t_{n-1}=t_4$
<table>
<tr><td>x</td><td>110</td><td>120</td><td>123</td><td>132</td><td>125</td><td>Total</td></tr>
<tr><td>y</td><td>120</td><td>118</td><td>125</td><td>136</td><td>121</td><td></td></tr>
<tr><td>d=x-y</td><td>-10</td><td>2</td><td>-2</td><td>-4</td><td>4</td><td>∑d=-10</td></tr>
<tr><td>d^2</td><td>100</td><td>4</td><td>4</td><td>16</td><td>16</td><td>$\sum d^2=140$</td></tr>
</table>
$\bar{d}$=(∑d)/n=-2 $S^2=30$ $|t|$ =0.816
The tabulated value of t for 4 d.f. and at 1% level of significance for a two-tailed test is 4.60. Since calculated value of 't' is less than tabulated t, it is not significant at 1% level of significance. Hence, the data do not provide any evidence against the null hypothesis which may be accepted. We may, therefore, conclude that there is no change in IQ after the training programme.</td>
<td>1
1
1</td>
</tr>
<tr>
<td>31</td>
<td><table>
<tr><td>t</td><td>y</td><td>$x=t_i-2012.5$</td><td>x^2</td><td>xy</td><td>$Y_t=a+bx$</td></tr>
<tr><td>2010</td><td>28</td><td>-2.5</td><td>6.25</td><td>-70</td><td>25.67</td></tr>
<tr><td>2011</td><td>32</td><td>-1.5</td><td>2.25</td><td>-48</td><td>29.67</td></tr>
<tr><td>2012</td><td>29</td><td>-0.5</td><td>0.25</td><td>-14.5</td><td>33.67</td></tr>
<tr><td>2013</td><td>35</td><td>0.5</td><td>0.25</td><td>17.5</td><td>37.67</td></tr>
<tr><td>2014</td><td>40</td><td>1.5</td><td>2.25</td><td>60</td><td>41.67</td></tr>
<tr><td>2015</td><td>50</td><td>2.5</td><td>6.25</td><td>125</td><td>45.67</td></tr>
<tr><td></td><td>∑y=214</td><td></td><td>$\sum x^2=17.50$</td><td>∑xy=70</td><td></td></tr>
</table>
$a=\frac{\sum y}{n}=35.67$ $b=\frac{\sum xy}{\sum x2}=4$
$y_{2016}=49.67$</td>
<td>2.5
1.5
1</td>
</tr>
<tr>
<td>32</td>
<td>Let the length, breadth and depth of the open tank be x, x and y, respectively
let V denotes its volume and S denotes its surface area.
V = x^2y ......(i) S= $x^2 + 4xy$ ....(ii)</td>
<td>1
1.5
1.5</td>
</tr>
</table>

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<tr>
<td></td>
<td>From (i) and (ii) S= $x^2+\frac{1600}{x^2}$
$\frac{ds}{dx}=2x-\frac{1600}{x^2}$
On putting $\frac{ds}{dx}=0$ we get $x^3=800$, $x=2(100)^{\frac{1}{3}}$
$\frac{d^2S}{dx^2}=2+\frac{3200}{x^3}$
From $x^3=800$,$\frac{d^2S}{dx^2}>0$
Therefore surface area is minimum when x=$2(100)^{\frac{1}{3}}$ and $y=(100)^{\frac{1}{3}}$</td>
<td>1</td>
</tr>
<tr>
<td>33</td>
<td>i)
μ=8 , σ =5 Z=0.4 (for X=10) Z=1.2 (for X=14)
Now P(.4<Z<1.2)=0.2295
No. Of students between 10 to 14 years=100x.2295 ~23
(ii) P(Z>1.2)=0.5-0.38549=0.1151
No. Of students more than 14 years=100x0.1151 ~12
OR
Probability of defective bucket = 0.03 n = 100 m = np = 100 x 0.03 = 3
Let X = number of defective buckets in a sample of 100
(i) P (no defective bucket) = P(r = 0) = 0.049
(ii) (ii) P (at most one defective bucket) = P(r = 0, 1) = 0.196</td>
<td>2.5
2.5
1
2
2</td>
</tr>
<tr>
<td>34</td>
<td>(i) EMI = ₹4832.69
(ii) Principal outstanding at beginning of 40th month=₹96096.72
(iii) The interest paid in 40th payment= ₹480.48
(iv) The principal paid in 40th payment=₹4352.21
(v) Total interest paid=₹39961.40</td>
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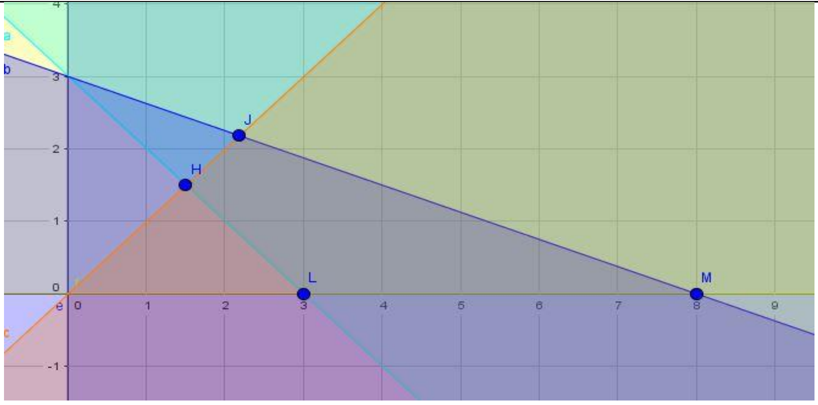
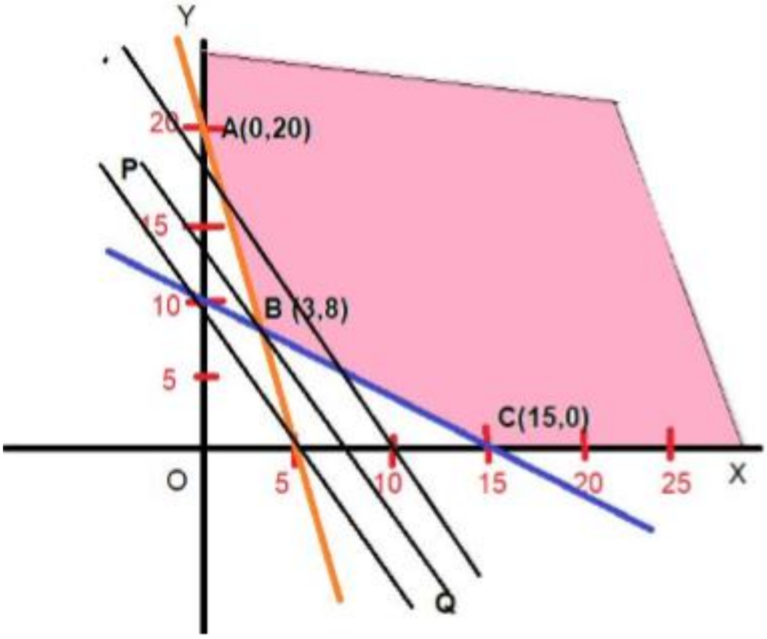
</tr>
<tr>
<td>35</td>
<td>

Feasible region is HlMJ
<table>
<tr><td>Corner points</td><td>Objective function Z= 22x +44 y</td></tr>
<tr><td>H(3/2,3/2)</td><td>77</td></tr>
<tr><td>L(3,0)</td><td>66</td></tr>
<tr><td>M(8,0)</td><td>176 (max value)</td></tr>
<tr><td>J(24/11,24,11)</td><td>144</td></tr>
</table></td>
<td>2
2
1</td>
</tr>
</table>

	Therefore objective function attains its maximum value 176 at point M(8,0) OR  The line 18x + 10y =180 meets the co-ordinate axes at (10, 0) and (0, 18). The coordinates of B(3,8) by solving the lines 4x + y = 20 and 2x + 3y = 30. The minimum value of Z is 134 at x = 3 and y = 8	**2** **1** **1** **1**
36	(i) $3\frac{3}{7}$ hours (ii) 12 hours (iii) 24 hours OR 4.8 hours	**1** **1** **2**
37	(i) ₹7000 (ii) ₹14000 (iii) ₹21000 OR 330	**1** **1** **2**
38	(i) ₹ 410293.41 (ii) ₹ 15712.67 (iii) ₹2800276.80 OR ₹ 24167.82	**1** **1** **2**