

INDIAN SCHOOL MUSCAT
PREBOARD-2 (2021-2022)
APPLIED MATHEMATICS (241)
CLASS 12
MARKING SCHEME

1	$\log \int x dx - \int \frac{1}{x} \cdot \frac{x^2}{2} dx \Rightarrow \frac{x^2}{2} \log x - \frac{x^2}{4} + c$ OR $MC = 3000e^{0.3x} + 50, \quad \frac{dC}{dx} = 3000e^{0.3x} + 50$ $C = 10,000e^{0.3x} + 50x + k$ $80,000 = 10,000e^{(0.3)(0)} + 50(0) + k$ $k = 70,000$ $C = 10,000e^{0.3x} + 50x + 70,000$	1 + 1 ½ ½ ½ ½ ½															
2	Periodic payment, $R = 3,000$ Interest per annum, $i = 4/100 = 0.04$. Present value, $P = R + R/r$ $R = 3000 + 3000/0.04$ $= 3000 + 75000 = 78000$ Therefore, an amount of ₹ 78000 is needed OR $FV = ₹ 550000 \quad PV = ₹ 300000 \quad n = 2 \text{ years}$ $\text{CAGR} = \left(\frac{FV}{PV}\right)^{\frac{1}{n}} - 1 = \left(\frac{550000}{300000}\right)^{\frac{1}{2}} - 1$ $= (1.8333)^{0.5} - 1 = 0.354006$ Thus JBC Earthmovers has a 35.40 % CAGR	½ ½ 1 ½ ½ ½															
3	Development of Hypothesise Null Hypothesis $H_0: \mu = 0.025 \text{ cm}$, i.e., there is no significant deviation between sample and population mean where sample mean $x = 0.024$ and population mean $\mu = 0.025$. Alternative Hypothesis $H_1: \mu \neq 0.025 \text{ cm}$ Calculation of Mean and Standard Deviation We have $n = 10, x = 0.024 \text{ cm}, S = 0.002 \text{ cm}$ Test Statistics $t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{0.024 - 0.025}{\frac{0.002}{\sqrt{10}}} = \frac{-0.001 \times \sqrt{10}}{0.002} = -\frac{3.162}{2} = -1.581$	½ ½ ½ ½ ½															
4	For each component	½ (4)															
5	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Corner point (1 mark)</th> <th style="width: 33%;">Z = 3x + 2y (½ mark)</th> <th style="width: 33%;">Conclusion (½ mark)</th> </tr> </thead> <tbody> <tr> <td>O (0,0)</td> <td>= 0 + 0 = 0</td> <td>Minimum value is 0</td> </tr> <tr> <td>A (52,0)</td> <td>= 156 + 0 = 156</td> <td></td> </tr> <tr> <td>E (44, 16)</td> <td>= 132 + 32 = 166</td> <td></td> </tr> <tr> <td>D (0,38)</td> <td>= 0 + 76 = 76</td> <td></td> </tr> </tbody> </table>	Corner point (1 mark)	Z = 3x + 2y (½ mark)	Conclusion (½ mark)	O (0,0)	= 0 + 0 = 0	Minimum value is 0	A (52,0)	= 156 + 0 = 156		E (44, 16)	= 132 + 32 = 166		D (0,38)	= 0 + 76 = 76		
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6	<p>Nominal rate, $r = \frac{9}{100} = 0.09$</p> <p>Conversion periods per year, $m = 3$</p> $r_e = \left(1 + \frac{r}{m}\right)^m - 1 \quad r_e = \left(1 + \frac{0.09}{3}\right)^3 - 1$ $= (1.03)^3 - 1 = 1.092727 - 1$ $= 0.092727 = 9.2727\%$ <p>Therefore, the effective rate allowed by the bank is 9.2727% p.a.</p>	½ ½ ½ ½																																																
7	<p>Let T represent the year and Y represent the tourists arrivals in year T. number of year is $n = 7$ which is odd.</p> <p>Thus we take middle year 2007 as origin and use transformation $u = T - 2007$</p> <p>Using this transformation straight line trend is defined by the equation</p> $Y = a + bu \quad (1) \quad \text{or} \quad Y = a + b(T - 2007) \quad (2)$ <p>Using this transformation we prepare following table.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th>Year (T)</th> <th>Y</th> <th>u</th> <th>u^2</th> <th>uY</th> </tr> </thead> <tbody> <tr><td>2004</td><td>18</td><td>-3</td><td>9</td><td>-54</td></tr> <tr><td>2005</td><td>20</td><td>-2</td><td>4</td><td>-40</td></tr> <tr><td>2006</td><td>23</td><td>-1</td><td>1</td><td>-23</td></tr> <tr><td>2007</td><td>25</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>2008</td><td>24</td><td>1</td><td>1</td><td>24</td></tr> <tr><td>2009</td><td>28</td><td>2</td><td>4</td><td>56</td></tr> <tr><td>2010</td><td>30</td><td>3</td><td>9</td><td>90</td></tr> <tr><td colspan="2" style="text-align: right;">168</td><td>0</td><td>28</td><td>53</td></tr> </tbody> </table> <p>Substituting a and b in (1) we have the equation of the trend line as</p> $Y = 24 + 1.89u \quad \text{or} \quad Y = 24 + 1.89(T - 2007)$ <p>For year 2017 we have</p> $Y = 24 + 1.89(214 - 2007)$ $= 24 + 1.89 \times 7 = 37.23$	Year (T)	Y	u	u^2	uY	2004	18	-3	9	-54	2005	20	-2	4	-40	2006	23	-1	1	-23	2007	25	0	0	0	2008	24	1	1	24	2009	28	2	4	56	2010	30	3	9	90	168		0	28	53	½ ½ ½ ½			
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8	<p>Original value, $C = ₹ 2,500,000$ Salvage value, $S = ₹ 1,000,000$ Useful life, $n = 5$ years Using linear method annual depreciation D is given by $D = \frac{C-S}{n}$</p> <p>(i) $D = \frac{2500000 - 1000000}{5} = ₹ 300,000$</p> <p>(ii) Percentage depreciation, $= \frac{D}{C-S} \times 100$ $= \frac{300000}{2500000 - 1000000} = 20\%$</p> <p>(iii) The book value at the end of second year $= 2,500,000 - 2 \times 300,000 = 2,500,000 - 600,000$ $= ₹ 1,900,000$</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1
9	<p>Using partial fractions and finding $A = -1$ and $B = 3$ Getting $I = -\log x+3 + 3\log x+4 + c = \log\left \frac{(x+4)^3}{(x+3)}\right + c$ OR</p> <p>Supply function, $100p = (x+20)^2$ When market price is ₹ 25, i.e $p_0 = 25$, $100 \times 25 = (x_0 + 20)^2 \quad 50 = x_0 + 20 \Rightarrow x_0 = 30$ Now the producer's surplus is $PS = p_0 \times x_0 - \int_0^{x_0} S(x) dx$ $PS = 25 \times 30 - \int_0^{30} \frac{(x+20)^2}{100} dx = 750 - \frac{1}{300}(x+20)^3 \Big _0^{30}$ $= 750 - \frac{1}{300}[(50)^3 - (20)^3] = 360$</p>	1 $1 + 1$ 1 $\frac{1}{2}$ 1 $\frac{1}{2}$

