

MT

2017 _____ 1100

Seat No.

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MT- GENERAL MATHEMATICS (71) ALGEBRA- SEMI PRELIM II- PAPER- II(E)

Time : 2½ Hours

Model Answer Paper

Max. Marks : 40

A.1.	Attempt ANY FIVE of the following :	
(i)	$x + 2x^3 = 7$ i.e. $2x^3 + x - 7 = 0$ \therefore Highest power (Degree) is not 2. m This is not a quadratic equation.	1
(ii)	$I \propto \frac{1}{R}$	
(iii)	Sale Price = ₹ 20,000 Rate of CST = 2% CST = Sale Price \times Rate of CST $= 20000 \times \frac{2}{100}$ $= 200 \times 2$ $= ₹ 400$ \therefore CST is ₹ 400.	1
(iv)	$3p + p^2 = 5$ $\therefore p^2 + 3p - 5 = 0$	1
(v)	$I = K \times \frac{1}{D^2}$ (K is constant) \Rightarrow Inverse variation.	1
(vi)	Income tax is ₹ 2000 Education cess rate is 3% Education cess = Income tax \times Rate of education cess $= 2000 \times \frac{3}{100}$ $= 20 \times 3$ $= ₹ 60$	1

A.2.	Solve ANY FOUR of the following :	
(i)	$x^2 - 49 = 0$ $\therefore x^2 - (7)^2 = 0$ $\therefore (x + 7)(x - 7) = 0$ $\therefore x + 7 = 0$ or $x - 7 = 0$ $\therefore x = -7$ or $x = 7$ $\therefore x = -7$ and $x = 7$ are the roots of given quadratic equation.	1 1
(ii)	$x \propto \frac{1}{y}$ $\therefore x = \frac{K}{y}$ [Where K is a constant] When $x = 33$ and $y = 12$ $\therefore 33 = \frac{K}{12}$ $\therefore K = 33 \times 12$ $\therefore x = \frac{33 \times 12}{y}$(i) [Equation of variation] Substituting $y = 11$ in (i), $\therefore x = \frac{33 \times 12}{11}$ $\therefore x = 3 \times 12 = 36.$ \therefore When $y = 11$; $x = 36.$	1 1
(iii)	List Price = ₹ 1250 Rate of discount = 10% Discount = List Price \times Rate of discount = $1250 \times \frac{10}{100}$ = ₹ 125 Sale Price = List Price - Discount = $1250 - 125$ = ₹ 1125 \therefore Sale Price is ₹ 1125	1 1
(iv)	$2y^2 - 2y + 2 = 0$ Comparing with $ax^2 + bx + c = 0$ $\therefore a = 2, b = -2, c = 2$ $\therefore b^2 - 4ac = (-2)^2 - 4(2)(2)$ = $4 - 16$ $\therefore b^2 - 4ac = -12$	1 1

(v)	<p>Let the number books be denoted by 'N' and cost of the books be denoted by 'C'.</p> <p>$\therefore N \propto C$</p> <p>$\therefore N = K \times C$ [Where K is constant].</p> <p>Substituting $N = 10$ and $C = 150$,</p> <p>$\therefore 10 = K \times 150$</p> <p>$\therefore K = \frac{10}{150}$</p> <p>$\therefore K = \frac{1}{15}$</p> <p>$\therefore N = \frac{1}{15} \times C$(i) [Equation of variation]</p> <p>When $C = 600$</p> <p>$\therefore N = \frac{1}{15} \times 600$</p> <p>$\therefore N = 40$</p> <p>$\therefore 40$ books can be purchased for Rs. 600.</p>	<p>1</p> <p>1</p>
(vi)	<p>Tax paid on purchase = ₹ 1250</p> <p>Tax collected on sale = ₹ 1475</p> <p>M-VAT payable = Tax collected on sale – Tax paid on purchase</p> <p style="padding-left: 40px;">= ₹ 1475 – ₹ 1250</p> <p style="padding-left: 40px;">= ₹ 225</p> <p>\therefore M-VAT payable by Fatima is ₹ 225</p>	<p>1</p> <p>1</p>
A.3. Solve ANY THREE of the following :		
(i)	<p>$y^2 - 11y + 24 = 0$</p> <p>$\therefore y^2 - 8y - 3y + 24 = 0$</p> <p>$\therefore y(y - 8) - 3(y - 8) = 0$</p> <p>$\therefore (y - 3)(y - 8) = 0$</p> <p>$\therefore y - 3 = 0$ or $y - 8 = 0$</p> <p>$\therefore y = 3$ or $y = 8$</p> <p>$\therefore y = 3$ and $y = 8$ are solutions of given quadratic equation.</p>	<p>1</p> <p>1</p> <p>1</p>
(ii)	<p>$a \propto \frac{1}{b}$</p> <p>$\therefore a = \frac{K}{b}$ [Where K is a constant]</p> <p>When $a = 20$ and $b = 4$</p> <p>$\therefore 20 = \frac{K}{4}$</p>	

	$\therefore K = 20 \times 4$ $\therefore K = 80$ $\therefore a = \frac{80}{b}$(i) [Equation of variation]	1								
	Substituting $a = 8$ in (i),									
	$\therefore 8 = \frac{80}{b}$									
	$\therefore b = \frac{80}{8}$									
	$\therefore b = 10$									
	Substituting $b = 5$ in (i),	$\frac{1}{2}$								
	$\therefore a = \frac{80}{5}$									
	$\therefore a = 16$	$\frac{1}{2}$								
	<table border="1"> <tbody> <tr> <td>a</td> <td>20</td> <td>8</td> <td>16</td> </tr> <tr> <td>b</td> <td>4</td> <td>10</td> <td>5</td> </tr> </tbody> </table>	a	20	8	16	b	4	10	5	1
a	20	8	16							
b	4	10	5							
(iii)	List Price = ₹ 28500 Rate of discount = 10% Rate of CST = 2% To find : Selling Price Discount = List price \times Rate of discount $= 28500 \times \frac{10}{100}$ $= 285 \times 10$ $= ₹ 2850$ Sale Price = List price - Discount $= 28500 - 2850$ $= ₹ 25650$	1								
	\therefore CST = Sale Price \times Rate of CST $= 25650 \times \frac{2}{100}$ $= 256.5 \times 2$ $= ₹ 513$	1								
	\therefore Selling Price = Sale Price + CST $= 25650 + 513$ $= ₹ 26163$	1								
	\therefore Selling Price is ₹ 26163	1								

	$\begin{aligned} \therefore \text{Third term} &= \left[\frac{1}{2} \times \text{coefficient of } y \right]^2 \\ &= \left[\frac{1}{2} \times \left(\frac{-4}{5} \right) \right]^2 \\ &= \left(\frac{-2}{5} \right)^2 \\ &= \frac{4}{25} \end{aligned}$ <p>Add $\frac{4}{25}$ on both side of (i),</p> $\therefore y^2 - \frac{4}{5}y + \frac{4}{25} = \frac{1}{5} + \frac{4}{25}$ $\therefore \left(y - \frac{2}{5} \right)^2 = \frac{9}{25}$ <p>Taking square root,</p> $\therefore y - \frac{2}{5} = \pm \frac{3}{5}$ $\therefore y = \frac{2}{5} \pm \frac{3}{5}$ $\therefore y = \frac{2+3}{5} \text{ or } y = \frac{2-3}{5}$ $\therefore y = \frac{5}{5} \text{ or } y = \frac{-1}{5}$ $\therefore y = 1 \text{ or } y = \frac{-1}{5}$ <p>$\therefore y = 1$ and $y = \frac{-1}{5}$ are solutions of given quadratic equation.</p>	<p>1</p> <p>1</p> <p>1</p>
(ii)	<p>Let the number of books be denoted by 'N' and its thickness be denoted by 't'</p> $\therefore N \propto \frac{1}{t}$ $\therefore N = \frac{k}{t}$ <p style="text-align: right;">[Where k is constant]</p>	<p>1</p>

	When $N = 180$; $t = 3$	
	$\therefore 180 = \frac{k}{3}$	
	$\therefore k = 180 \times 3$	1
	$\therefore N = \frac{180 \times 3}{t}$(i) [Equation of variation]	1
	Substituting $t = 2$ in (i)	
	$\therefore N = \frac{180 \times 3}{2}$	
	$\therefore N = 90 \times 3 = 270$	
	$\therefore 270$ books can be stacked in the shelf when thickness is 2 cm.	1
(iii)	Selling price is ₹ 1938 Discount rate is 5% CST rate is 2% Let the printed price be ₹ 100	
	Discount = List price \times Rate of discount	
	= $100 \times \frac{5}{100}$	
	= ₹ 5	
	Sale price = List price – Discount	
	= $100 - 5$	
	= ₹ 95	1
	CST = Sale price \times Rate of CST	
	= $95 \times \frac{2}{100}$	
	= $\frac{190}{100}$	
	= ₹ 1.90	1
	Selling price = Sale price + CST	
	= $95 + 1.90$	
	= ₹ 96.90	
	If the selling price is ₹ 96.90 then the list price is ₹ 100	
	If the selling price is ₹ 1938 then the list price is ₹ x	
	\therefore Ratio of selling price = Ratio of list price	1
	$\therefore \frac{96.90}{1938} = \frac{100}{x}$	
	$\therefore x = \frac{100 \times 1938}{96.90}$	
	$\therefore x = ₹ 2000$	
	\therefore Printed price of electric iron is ₹ 2000.	1

<p>A.5. Solve ANY TWO of the following :</p> <p>(i)</p>	<p>Let the breadth of rectangle be x</p> $\therefore \frac{\text{length}}{\text{breadth}} = \frac{8}{5}$ $\therefore \frac{\text{length}}{x} = \frac{8}{5}$ $\therefore \text{length} = \frac{8}{5}x$ <p>\therefore Area of rectangle = length \times breadth</p> $\therefore 1000 = \frac{8}{5}x \times x$ $\therefore 1000 \times 5 = 8x^2$ $\therefore \frac{5000}{8} = x^2$ $\therefore x^2 = 625$ $\therefore x = \pm 25 \quad \text{[Taking square root on the both sides]}$ <p>\therefore x is breadth</p> <p>$\therefore x \neq 25$</p> <p>$\therefore x = 25$</p> $\therefore \text{length} = \frac{8}{5} \times 25$ $\therefore \text{length} = 40$ <p>\therefore Length and breadth is 40m and 25m respectively.</p> <p>(ii) Let the force of attraction be denoted by and its distance be denoted by 'd'.</p> $\therefore F \propto \frac{1}{d^2}$ $\therefore F = \frac{k}{d^2} \quad \text{[Where k is constant]}$ <p>When F = 2.5; d = 1.4</p> $\therefore 2.5 = \frac{k}{(1.4)^2}$ $\therefore k = 2.5 \times 1.4 \times 1.4$ $\therefore F = \frac{2.5 \times 1.4 \times 1.4}{d^2} \quad \dots\dots(i) \quad \text{[Equation of variation]}$ <p>Substituting d = 0.7m</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p> <p>1</p>
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	$\therefore F = \frac{2.5 \times 1.4 \times 1.4}{0.7 \times 0.7}$	1
	$\therefore F = \frac{2.5 \times 14 \times 14}{7 \times 7}$	
	$\therefore F = 2.5 \times 2 \times 2$	
	$\therefore F = 2.5 \times 4$	
	$\therefore F = 10$	1
	\therefore The force of attraction between the same poles is 10N when distance between them is 0.7m.	1
(iii)	Gross annual income is ₹ 350000	
	(A) Gross annual income = ₹ 350000	1
	(B) Deductions	
	(a) PM's relief fund = 5000	
	(b) N.S.C. = 12000	
	Total investment = 17000	
	Total Deduction is ₹ 17000	1
	(C) Taxable income = [A] - [B]	
	= 350000 - 17000	
	= ₹ 333000	1
	(D) Taxable paid :	
	(a) For first 250000 at 0% = ₹ 0	
	(b) For next (333000 - 250000) = ₹ 83000 at 10%	
	= $83000 \times \frac{10}{100}$	
	= ₹ 8300	1
	(E) Education cess at 3% = $8300 \times \frac{3}{100}$	
	= ₹ 249	
	(F) Net income tax payable = [D] + [E]	
	= 8300 + 249	
	= 8549	
	Rounded off to nearest multiple of 10 = ₹ 8550.	
	Mr. Ganesh Thakar has to pay ₹ 8550 as income tax.	1

