

MT

2017 _____ 1100

Seat No.

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

Time : 2½ Hours

Model Answer Paper

Max. Marks : 40

A.1.	Attempt ANY FIVE of the following :	
(i)	$4y^2 + 1 = 8y$ i.e. $4y^2 - 8y + 1 = 0$ Here $a = 4$, $b = -8$, $c = 1$ are real numbers, where $a \neq 0$ So it is a quadratic equation in variable y .	1
(ii)	$I \propto V$	1
(iii)	Sale Price = ₹ 11500 Rate of CST = 2% CST = Sale Price \times Rate of CST $= 11500 \times \frac{2}{100}$ $= 115 \times 2$ $= ₹ 230$ \therefore CST is ₹ 230.	1
(iv)	$m(2m + 1) = 0$ $\therefore 2m^2 + m = 0$ $\therefore 2m^2 + m + 0 = 0$	1
(v)	$D = \frac{M}{V}$ (M is constant) \Rightarrow Inverse Variation.	1
(vi)	Income tax is ₹ 500 Education cess is 3% Education cess = Income tax \times Rate of education cess	

	$= 500 \times \frac{3}{100}$ $= ₹ 15$	1
A.2.	Solve ANY FOUR of the following :	
(i)	$n^2 - 36 = 0$ $m (n)^2 - (6)^2 = 0$ $m (n + 6) (n - 6) = 0$ $m n + 6 = 0$ or $n - 6 = 0$ $m n = -6$ or $n = 6$ $\therefore n = -6$ and $n = 6$ are solutions of given quadratic equation.	1
(ii)	$x \propto \frac{1}{y}$ $\therefore x = \frac{K}{y}$ [Where K is constant] Substituting $x = 10$ and $y = 8$ $\therefore 10 = \frac{K}{8}$ $\therefore K = 10 \times 8$ $\therefore K = 80$ $\therefore x = \frac{80}{y}$(i) [Equation of variation]	1
	Substituting $x = 4$ in (i), $\therefore 4 = \frac{80}{y}$ $\therefore y = \frac{80}{4}$ $\therefore y = 20$ \therefore When $x = 4$; $y = 20$	1
(iii)	List Price = ₹ 1500 Rate of discount = 10% Discount = List Price \times Rate of discount $= 1500 \times \frac{10}{100}$	

	$= 15 \times 10$ $= ₹ 150$	1
	Sale Price = List Price – Discount $= 1500 - 150$ $= ₹ 1350$	
	∴ Sale Price is ₹ 1350	1
(iv)	$p^2 - 4p + 4 = 0$ Comparing with $ax^2 + bx + c = 0$ m $a = 1, b = -4, c = 4$	1
	m $b^2 - 4ac = (-4)^2 - 4(1)(4)$ $= 16 - 16$	
	m $b^2 - 4ac = 0$	1
(v)	∴ $N \propto W$	½
	∴ $N = K \times W$ [Where K is constant]	
	Substituting $N = 12$ and $W = 40$, $12 = K \times 40$	
	∴ $K = \frac{12}{40}$	
	∴ $K = \frac{3}{10}$	
	∴ $N = \frac{3}{10} \times W$(i) [Equation of Variation]	½
	When $W = 2500$ gm	
	∴ $N = \frac{3}{10} \times 2500$	
	∴ $N = 3 \times 250$	
	∴ $N = 750$	
	∴ The number of sheets whose weight is 2500 gm. are 750.	1
(vi)	Tax paid on purchase = ₹ 100500 Tax collected on sale = ₹ 122500 Net VAT payable = Tax collected on sale – Tax paid on purchase	1
	$= 122500 - 100500$ $= ₹ 22000$	
	∴ Net VAT payable by Kumkum Stores is ₹ 22000.	1

A.3. Solve ANY THREE of the following :

(i) $b^2 + 2b - 35 = 0$
 m $b^2 + 7b - 5b - 35 = 0$
 m $b(b + 7) - 5(b + 7) = 0$
 m $(b + 7)(b - 5) = 0$
 m $b + 7 = 0$ or $b - 5 = 0$
 m $b = -7$ or $b = 5$
 $\therefore b = -7$ and $b = 5$ is solution of given quadratic equation.

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(ii) $n \propto m$
 $\therefore n = Km$ [Where K is constant]
 When $m = 4$ and $n = 16$
 $\therefore 16 = K \times 4$
 $\therefore K = \frac{16}{4}$
 $\therefore K = 4$
 $\therefore n = 4m$ (i) [Equation of variation]
 \therefore Substituting $m = 12$ in (i),
 $n = 4 \times 12$
 $\therefore n = 48$
 Substituting $n = 28$ in (i),
 $\therefore 28 = 4 \times m$
 $\therefore m = \frac{28}{4}$
 $\therefore m = 7$

 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

1

m	4	5	12	7
n	16	20	48	28

(iii) List Price = ₹ 30000
 Rate of discount = 10%
 Rate of CST = 2%
 To find : Selling Price
 Discount = List price \times Rate of discount
 $= 30000 \times \frac{10}{100}$
 $= 300 \times 10$
 $= ₹ 3000$
 Sale Price = List price - Discount
 $= 30000 - 3000$
 $= ₹ 27000$

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	$\begin{aligned} \therefore \text{CST} &= \text{Sale Price} \times \text{Rate of CST} \\ &= 27000 \times \frac{2}{100} \\ &= 270 \times 2 \\ &= ₹ 540 \end{aligned}$	1
	$\begin{aligned} \therefore \text{Selling Price} &= \text{Sale Price} + \text{CST} \\ &= 27000 + 540 \\ &= ₹ 27540 \end{aligned}$	1
	$\therefore \text{Selling Price is ₹ 27540}$	1
(iv)	$3x^2 + 5x + 3 = 0$ <p>Comparing with $ax^2 + bx + c = 0$</p> <p>m $a = 3, b = 5, c = 3$</p> $\begin{aligned} \text{m } b^2 - 4ac &= (5)^2 - 4(3)(3) \\ &= 25 - 36 \\ &= -11 \end{aligned}$ <p>m $b^2 - 4ac < 0$</p>	1
	$\therefore \text{This quadratic equation has no real roots.}$	1
(v)	<p>Selling Price for dealer = ₹ 1,50,000</p> <p>Selling Price for wholesaler = ₹ 1,80,000</p> <p>Selling Price for retailer = ₹ 2,20,000</p> <p>VAT rate is 12.5%</p> <p>For first sale i.e. dealer to wholesaler</p> <p>Tax paid by wholesaler = Tax collected by Dealer</p> $\begin{aligned} &= 150000 \times \frac{12.5}{100} \\ &= 1500 \times 12.5 \\ &= 150 \times 125 \\ &= ₹ 18750 \end{aligned} \quad \dots(i)$ <p>For second sale i.e Wholesaler to retailer</p> <p>Tax paid by retailer = Tax collected by wholesaler</p> $\begin{aligned} &= 180000 \times \frac{12.5}{100} \\ &= 1800 \times 12.5 \\ &= 180 \times 125 \\ &= ₹ 22500 \end{aligned} \quad \dots(ii)$	1

	<p>Net Vat Payable at second stage = Tax collected on sale – Tax paid on purchase = 22500 – 18750 = ₹ 3750</p> <p>For third sale i.e. retailer to customer Tax paid by customer = Tax collected by retailer = $220000 \times \frac{12.5}{100}$ = 2200×12.5 = 220×125 = ₹ 27500(iii)</p> <p>Net VAT payable at third = Tax collected on sale – Tax paid on purchase = 27500 – 22500 [From (ii) and (iii)] = ₹ 5000</p> <p>Tax paid at first stage of trading is ₹ 18750 M-VAT paid at second stage of trading is ₹ 3750. M-VAT paid at third stage of trading is ₹ 5000.</p>	
A.4.	Solve ANY TWO of the following :	
(i)	$4x^2 + 7 - 12x = 0$	
	$4x^2 - 12x + 7 = 0$	
	Divide throughout by 4,	
m	$x^2 - 3x + \frac{7}{4} = 0$	
m	$x^2 - 3x = \frac{-7}{4}$(i)	$\frac{1}{2}$
	\therefore Third term = $\left[\frac{1}{2} \times \text{coefficient of } x \right]^2$	$\frac{1}{2}$
	= $\left[\frac{1}{2} \times (-3) \right]^2$	
	= $\frac{9}{4}$	$\frac{1}{2}$
m	Add $\frac{9}{4}$ on both side of equation (i),	
m	$x^2 - 3x + \frac{9}{4} = \frac{-7}{4} + \frac{9}{4}$	
m	$\left(x - \frac{3}{2} \right)^2 = \frac{2}{4}$	1

	<p>Taking square root on both side,</p> $m \left(x - \frac{3}{2} \right) = \pm \frac{\sqrt{2}}{2}$ $m x = \frac{3}{2} \pm \frac{\sqrt{2}}{2}$ $m x \frac{3 \pm \sqrt{2}}{2}$ $m x = \frac{3 + \sqrt{2}}{2} \text{ or } x = \frac{3 - \sqrt{2}}{2}$ <p>$\therefore x = \frac{3 + \sqrt{2}}{2}$ and $x = \frac{3 - \sqrt{2}}{2}$ are solutions of given quadratic equation.</p>	<p>$\frac{1}{2}$</p> <p>1</p>
(ii)	<p>Let the length of the shadow of an object be denoted by 'l' and its height be denoted by 'h'</p> <p>$\therefore l \propto h$</p> <p>$\therefore l = K \times h$ [Where K is constant]</p> <p>Substituting $l = 64$, $h = 40$.</p> <p>$\therefore 64 = K \times 40$</p> <p>$\therefore K = \frac{64}{40}$</p> <p>$\therefore K = \frac{6.4}{4}$</p> <p>$\therefore K = 1.6$</p> <p>$\therefore l = 1.6 \times h$ (i) [Equation of variation]</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>
(iii)	<p>Selling price = ₹ 7344</p> <p>Rate of discount = 10%</p> <p>Rate of CST = 2%</p> <p>Let the list price be ₹ 100</p> <p>$\therefore \text{Discount} = \text{List price} \times \text{Rate of discount}$</p>	<p>$\frac{1}{2}$</p> <p>1</p>

$= 100 \times \frac{10}{100}$ $= ₹ 10$	
<p>Sale price = List price - Discount</p> $= 100 - 10$ $= ₹ 90$	
<p>CST = Sale price × Rate of CST</p> $= 90 \times \frac{2}{100}$ $= \frac{180}{100}$ $= ₹ 1.80$	1
<p>Selling price = Sale price + CST</p> $= 90 + 1.80$ $= ₹ 91.80$	1
<p>If the selling price is ₹ 91.80 then the list price is ₹ 100</p> <p>If the selling price is ₹ 7344, then the list price is ₹ x</p> <p>∴ Ratio of selling price = Ratio of list price</p>	
$\frac{91.80}{7344} = \frac{100}{x}$	1
$x = \frac{100 \times 7344}{91.8}$	
$x = ₹ 8000$	
<p>∴ Marked price of sewing machine is ₹ 8000.</p>	1
<p>A.5. Solve ANY TWO of the following :</p> <p>(i) Let the base of triangle be x m</p> <p>∴ height = (x - 10) m</p> <p>As per the condition,</p>	
$A = \frac{1}{2} \times b \times h$	1
$\therefore 600 = \frac{1}{2} \times x \times (x - 10)$	
$\therefore 1200 = x^2 - 10x$	1
$\therefore x^2 - 10x = 1200$	
$\therefore x^2 - 10x - 1200 = 0$	

$\therefore x^2 + 30x - 40x - 1200 = 0$ $\therefore x(x + 30) - 40(x + 30) = 0$ $\therefore (x + 30)(x - 40) = 0$ $\therefore x + 30 = 0$ or $x - 40 = 0$ $\therefore x = -30$ or $x = 40$ $\therefore x$ is base of triangular field $\therefore x \neq -30$ \therefore The base of triangular field is 40 m.	<p>1</p> <p>1</p> <p>1</p>
<p>.....</p> $\therefore P \propto S^2$ $\therefore P = K \times S^2$ [Where K is constant] When $P = 1550 \text{ N/m}^2$; $S = 25 \text{ km/hr}$. $\therefore 1550 = K \times (25)^2$ $\therefore K = \frac{1550}{25 \times 25}$ $\therefore K = \frac{62}{25}$ $\therefore P = \frac{62}{25} S^2$(i) [Equation of Variation] Substituting $S = 75 \text{ km/hr}$ in (i) $\therefore P = \frac{62}{25} \times 75 \times 75$ $\therefore P = 62 \times 3 \times 75$ $\therefore P = 13950$ \therefore The pressure of wind on plane surface is 13950 N/m^2 when speed is 75 km/hr .	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
(iii) Monthly income of Mr. Deshpande is ₹ 23700 (A) Gross Annual income = 23700×12 = ₹ 284400 (B) Deductions : (i) Under 80C (a) PF = ₹ 2300×12 = ₹ 27600 (b) NSC = ₹ 10000	<p>1</p>

(ii) Under 80G Donations ₹ 6000 (cm relief fund) Total Deductions ₹ 43600	1
(C) Taxable income = [A] - [B] = 284400 - 43600 = ₹ 240800	1
(D) Total tax to be paid :	
(i) For first 200000 at 0% is Nil (240800 - 200000 = ₹ 40800)	
(ii) For next ₹ 40800 at 10% is = $\frac{10}{100} \times 40800$ = 10 × 408 = ₹ 4080	1
(E) Education cess is 3% on income tax = $\frac{3}{100} \times 4080$ = ₹ 122.4	
(F) Net tax payable = [D] + [E] = 4080 + 122.4 = ₹ 4202.4	
∴ Rounded off to the nearest multiple of 10 = ₹ 4200	
∴ Net income tax payable is ₹ 4200	1
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