MS-CIT
World-class Comprehensive Computer Course

Model Answer
Set- I
Std. – 10^{th} EM/Semi
Subject – Algebra

MKCL KLiC Courses
Gateway to Knowledge Lit Careers

Time : 2 Hrs. **Marks : 40**

Q.1 A) Solve Multiple choice questions. **4**

1) Option b

2) Option a
3) Option d
4) Option c.

B) Solve the following questions. **4**

1) $X^2 - 7x + 5 = 0$
Comparing with $ax^2 + bx + c = 0$ we get a = 1, b = -7, c = 5
2) $a = t^1 = -3$
$t^2 = t^1 + d = -3 + 0 = -3\ldots\ t^3 = t^2 + d = -3 + 0 = -3,$
$t^4 = t^3 + d = -3 + 0 = -3.$
$\therefore$ Arithmetic progression is -3, -3, -3 ……
3) Here possibility are : 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
$\therefore$ There are 11 cards bearing numbers 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
4) Rate of CGST is 6% and rate of SGST is 6%

Q.2 A) Complete the following activities. (Ant two) **4**

1) If one root of the quadratic equation $5m^2 + 2m + k = 0$ is $\frac{-7}{5}$ then find the value of k by completing the following activity.
$\frac{-7}{5}$ is the root of equation $5m^2 + 2m + k = 0$
$\therefore\ \frac{-7}{5}$ is satisfies the give equation.
Substituting = $\frac{-7}{5}$ in given equation.
$\therefore\ 5 \times \left(\frac{-7}{5}\right)^2 + 2 \times \frac{-7}{5} + k = 0$
$\therefore\ \frac{49}{5} + \frac{-14}{5} + k = 0$
$\therefore\ 7 + k = 0$
$\therefore\ k = -7$

2) The maximum bowling speed (km/h) of 33 players at a cricket coaching center is given in the following table. Find the modal bowling speed of a player.

Bowling speed (km/h)	**Number of players frequency**
85 - 10	9
100 - 115	11
115 - 130	8
130 - 145	5

Here, $L = 100,\ f_m = 11,\ f_1 = 9,\ f_2 = 8,\ h = 15.$

Mode = L + $\left[\frac{f_{m-}f_1}{2f_{m-}f_{1-}f_2}\right]$ h ……(Formula)

$= 100 + \left[\frac{11-9}{2(11)-9-8}\right] \times 15$ ……(Substituting the value)

$= 100 + \frac{2}{22-17} \times 15$

$= 100 + \frac{2}{5} \times 15$

$= 100 + 6 = 106$

The modal bowling speed of a player is 106 km/h.

3) Two dice are rolled simultaneously. Find thr probability that
i. the sum of the numbers on their upper faces is at the ost 5.
ii. The sum of the numbers on their upper face is at the least 6.

i. n(S) = 36
n(A) = 10

$\therefore$ P(A) = $\frac{n(A)}{n(S)}$

$= \frac{10}{36}$

$= \frac{5}{18}$

ii. n(S) = 36
n(A) = 26

P(A) = $\frac{n(A)}{n(S)}$

$= \frac{26}{36}$

$= \frac{13}{18}$

B) Solve the following question. (Any four) **8**

1)

Class Daily No. of hours	**Frequency (No. of workers) f_i**	**Cumulative frequency (less than)**
8-10	**150**	**150**
10-12	**500**	**600**
12-14	**300**	**950**
14-16	**50**	**1000**
Total	**$\sum f_i = 1000$**	**-**

Here total frequency $\sum f_i = N = 1000$.

$\therefore \frac{N}{2} = \frac{1000}{2} = 500$

$\therefore$ The median class is 10 – 12

$\therefore$ Median = L + $\left[\frac{\frac{N}{2} - cf}{f}\right]$ h

= 10 + $\left(\frac{500-150}{500}\right)$ 2

= 11.4

$\therefore$ Median no. of hours they work is 11.4 hours.

2) x + 7y = 10 …………I
3x – 2y = 7 …………II
Equation I can be written as
x = 10 – 7y …………III
Substituting the value of x in equation II
3x – 2y = 7
$\therefore$ 3(10 – 7y) – 2y = 7
$\therefore$ 30 – 2 \1y – 2y = 7
$\therefore$ 30 – 23y = 7
$\therefore$ - 23 = 7 – 30
$\therefore$ -23y = -23
$\therefore$ y = $\frac{-23}{-23}$
$\therefore$ **y = 1**
$\therefore$ Substituting y = 1 in equation III
x = 10 – 7y
$\therefore$ x = 10 – 7 ×1
$\therefore$ x = 10 – 7
$\therefore$ **x = 3**
$\therefore$ x = 3, y = 1 is the solution of given simultaneous equations.

3) The sample space is the set of all days in a year
$\therefore$ n(S) = 365
i. Let A be the event that both have different birthdays.
$\therefore$ n(A) = 364 ($\therefore$ Other friend can have birthday on any one of the remaining 364 days)
$\therefore$ P(A) = $\frac{n(A)}{n(S)} = \frac{364}{365}$
ii. Let b be the event that both have the same birthday.
$\therefore$ n(B) = 1 ($\therefore$ the other friend can have birthday only on the same day)
$\therefore$ P(B) = $\frac{n(B)}{n(S)} = \frac{1}{365}$

4) $\sqrt{5x^2} - x - \sqrt{5} = 0$
$\sqrt{5x^2} - x - \sqrt{5} =$
Comparing with $ax^2 + bx + c = 0$ we get,
a = $\sqrt{5}$, b = -1 c = - $\sqrt{5}$,

$\triangle = b^2 - 4ac$
= $(-1)^2 - 4 \times \sqrt{5} \times -\sqrt{5}$
= 1 + 20
$\therefore$ $\Delta = 21$

5) Here a = 14, d = 2, n = 100
$S_n = \frac{n}{2}$ [2a + (n-1)d]
$\therefore$ $S_{100} = \frac{100}{2}$ [2 × 14 + (100-1) × 2]
= 50 [28 + 198]
= 50 × 226 = 11300
$\therefore$ Sum of first 100 terms of given A.P. is 11,300

Q.3 A) Complete the following activity (Any two) **3**

1) $5x + 3y = 9$ ……………………………………………………….I

$2x - 3y = 12$ ……………………………………………………..II

Adding equation I and equation II

$$\begin{array}{rr} 5x+3y & =9 \\ +\ 2x-3y & =12 \\ \hline 7x \quad & =21 \end{array}$$

$\therefore\ x = \frac{21}{7}$

$\therefore\ x = 3$

Place $x = 3$ in equation I

$5 \times 3 + 3y = 9$

$\therefore\ 3y = 9 - 15$

$\therefore\ 3y = -6$

$\therefore\ y = \frac{-6}{3}$

$\therefore\ y = -2$

$(x,y) = (3,-2)$ is the solution of given simultaneous equations.

2) Form the quadratic equation from its roots.

3 and -10

Let $\alpha$and β are the roots of the quadratic equation.

Let $\alpha = 3$ and $\beta = -10$

$\therefore\ \alpha + \beta = 3 + (-10) = -7$ and

$a \times \beta = 3 \times -10 = -30$

Then required quadratic equation is

$\therefore x^2 - (\alpha + \beta) \times + \alpha\beta = 0$

$\therefore\ x^2 - (-7) \times -30 = 0$

$\therefore\ x^2 + 7x - 30 = 0$

B) Solve the following question. (Any two) **6**

1) Market value of share = Rs. 50

Brokerage = 0.2%

$\therefore$ Brokerage per share = 0.2% of Rs. 50

$= \frac{0.2}{100} \times 50$

= Rs. 0.10

GST per share = 18% of Rs, 0.10

$= \frac{18}{100} \times 0.10$

= Rs. 0.018

Total purchase price = Market value + Brokerage + GST

= 50 + 0.10 + 0.018

= Rs. 50.118

$\therefore$ Number shares purchased $= \frac{Total\ investment}{Purchase\ price\ per\ share}$

$= \frac{50118}{50.118}$

= 1000

Mr. Sanghvi purchased 1000 shares.

2) $x^2 + 2\sqrt{3x} + 3 = 0$

Comparing with $ax^2 + bx + c = 0$ we get,

$\therefore$ a = 1, b = $2\sqrt{3}$, c = 3

$b^2 - 4ac = (2\sqrt{3})^2 - 4 \times 1 \times 3$

$= 12 - 12$

$= 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{2\sqrt{3} \pm \sqrt{0}}{2\times 1}$

$= \frac{-2\sqrt{3} \pm 0}{2}$

$\therefore x = \frac{-2\sqrt{3}+0}{2}$ or $x = \frac{-2\sqrt{3}-0}{2}$

$\therefore x = \frac{-2\sqrt{3}}{2}$ or $x = \frac{-2\sqrt{3}}{2}$

$\therefore x = -\sqrt{3}$ or $x = -\sqrt{3}$

$\therefore$ The roots of the given quadratic equations are $-\sqrt{3}$ and $-\sqrt{3}$

3) S = {10, 12 , 13, 14, 15, 20, 21, 23, 24, 25, 30, 31, 32, 34, 35, 36, 40, 41, 42, 43, 45, 50, 51, 52, 53, 54}

$\therefore$ n(S) = 25

A is the event that the number formed is even.

A = {10, 12, 14, 20, 24, 30, 3 2 , 34, 40, 42, 50, 52, 54}

$\therefore$ n(A) = 13

B is the event that the number formed is divisible by 3

B = {12, 15, 21, 24, 30, 42, 45, 51, 54}

$\therefore$ n(B) = 9

C is the event that the number formed is greater than 50.

C = {51, 52, 53, 54}

$\therefore$ n© = 4

4) Given A.P. 3, 8, 13, 18….

Here $t_1 = 3$, $t_2 = 8$, $t_3 = 13$, $t_4 = 18$ ….

$d = t_2 - t_1 = 8-3 = 5$

We know that $t_n = a + (n-1)\, d$

$\therefore$ $t_n = 3+(n-1)\times 5$ because a = 3, d = 5

$\therefore$ $t_n\ 3 + 5n - 5$

$\therefore$ $t_n = 5n - 2$

$\therefore$ 30th term = $t_{30} = 5 \times 30 - 2$

$= 150 - 2 = 148$

Q.4 Solve the following questions. (Any two) **8**

1) Let taps A and B take x and y days respectively to fill the swimming pool.

In one day tap A fills $\frac{1}{x}$ part of the swimming pool

In one day tap B fills $\frac{1}{y}$ part of the swimming pool

Both taps together fill the swimming pool in 15 days

$\therefore$ Both taps together fill $\frac{1}{15}$ part of the swimming pool in 1 day.

$\therefore \frac{1}{x} + \frac{1}{y} = \frac{1}{15}$ ……….(1)

Taps A and B are kept open for 12 days.

$\therefore$ in 12 days these taps fill $\frac{12}{x} + \frac{12}{y}$ part of the swimming pool.

Now, tap B is closed and tap A takes another 8 days to fill the swimming pool.

$\therefore \frac{12}{x} + \frac{12}{y} + \frac{8}{x} = 1 \qquad \therefore \frac{20}{x} + \frac{12}{y} = 1$ ……….(2)

Substituting m for $\frac{1}{x}$ and n for $\frac{1}{y}$, we get,

$m + n = \frac{1}{15}$ $\quad \therefore 15m + 15n = 1$ ………(3)

and $20m + 12n = 1$ ……….(4)

Multiplying equation (3) by 4 and equation (4) by 3

$$\begin{array}{rcl} 60m + 60n &=& 4 \\ 60m + 36n &=& 3 \\ - \quad - & & - \\ \hline 24n &=& 1 \end{array}$$

... (5)

... (6)

... [Subtracting equation (6) from equation (5)]

$\therefore n = \frac{1}{24}$

Substituting $n = \frac{1}{24}$ in equation (4)

$30m + 12 \times \frac{1}{24} = 1 \qquad \therefore 20m + \frac{1}{2} = 1 \qquad \therefore 20m = \frac{1}{2}$

$\therefore m = \frac{1}{40}$

Re-substituting the values of m and n, we get,

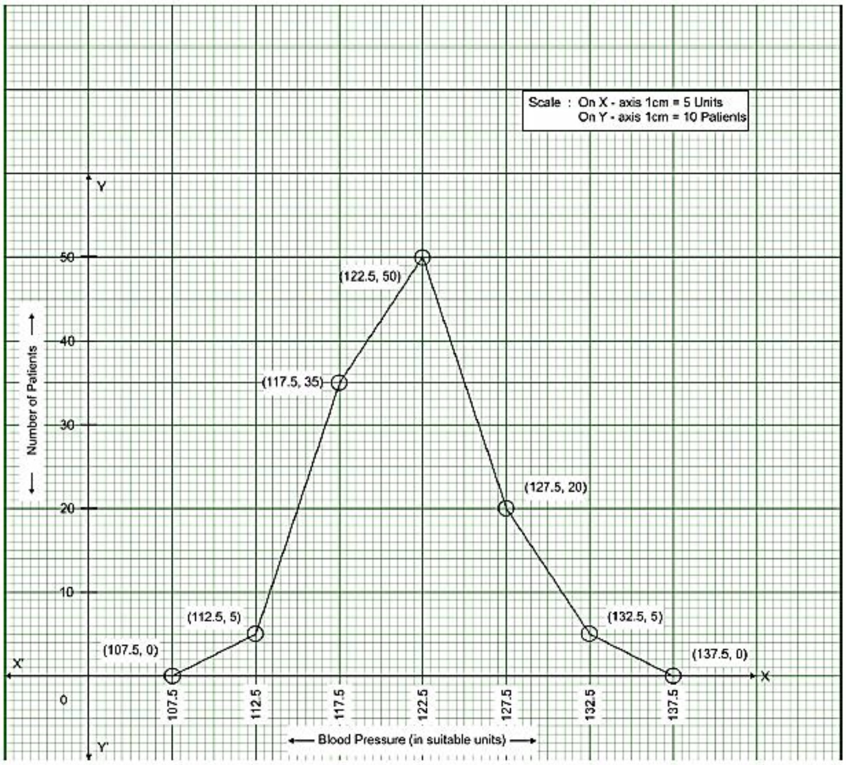
$m = \frac{1}{x} = \frac{1}{24} = 1 \quad \therefore x = 40$

and $n = \frac{1}{y} = \frac{1}{24} \quad \therefore y = 24$

Individually tap A and tap B requires 40 days and 24 days respectively to fill the swimming pool..

2)

Blood pressure (in suitable units)	105 - 110	110 - 115	115 - 120	120 - 125	125 - 130	130 - 135	135 - 140
Class mark	107.5	112.5	117.5	122.5	127.5	132.5	137.5
Number of patients	0	5	35	50	20	5	0



3) Amount invested by Mrs. Agarwal = Rs. 10,200

Market value per share = Rs. 100

Brokerage per share = 0.1% of Rs. 100

The number of shares received by Smt Mita $= \frac{Investment}{MV\ of\ one\ share}$

$= \frac{10,200}{100}$

= 102

Smt Mita received 102 shares

She paid 0.1% brokerage for buying 102 shares

$\therefore$ brokerage = $\frac{0.1}{100} \times 102$ = Rs 10.20

Total amount by Smt Mita for purchasing shares = Rs (10200 + 10.20) = Rs 10210.20 ……… (1)

She sold 60 shares when MV was Rs 125

Amount received by Smt Mita by selling 60 shares = Number of shares × MV ……..(2)

= 60 × 125

= Rs 7500

Remaining shares = 102 – 60 = 42

42 shares are sold at MV Rs 90

Amount received by Smt Mita by selling 42 shares = 42×90 ………..(3)

= Rs 3780

The total amount received by Smt Mita = Rs (7500 + 3780) ….[From (2) & (3)]

= Rs 11,280 ……………….(4)

She paid brokerage 0.1% for each trading

Brokerage paid = amount × percentage of brokerage = Rs 11280 × $\frac{0.1}{100}$ = Rs 11.28 ……. (5)

Actual amount received by Smt Mita

= amount by selling shares – brokerage

= Rs (11280-11.28) = Rs 11268.72 ………[From (4) & (5)] ……..(6)

The actual amount received by Smt Mita is more than her investment.

Profit = the actual amount received – the amount invested

= Rs (11268.72 – 10210.20) ……………..[From (6) & (1)]

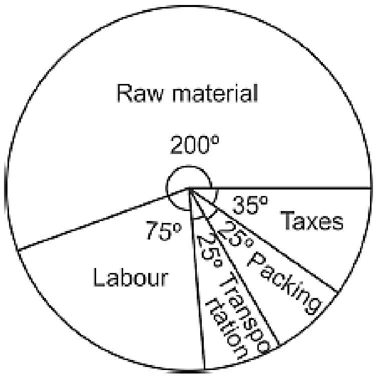
= Rs 1058.52

Q.5 Solve the following questions. (Any one) **3**

1) The expenditure for each component is converted into central angle

Component	**Expenditure** (in rs.)	**Measure of the central angle**
Raw material	800	$\frac{800}{1440} \times 360° = 200°$
Labour	300	$\frac{300}{1440} \times 360° = 75°$
Transportation	100	$\frac{100}{1440} \times 360° = 25°$
Packing	100	$\frac{100}{1440} \times 360° = 25°$
Taxes	140	$\frac{140}{1440} \times 360° = 35°$
Total	1440	360°

On the basis of the table, the pie diagram is drawn:



2) $2x + y = 19$

$2x - 3y = -3$

$D = \begin{vmatrix} 2 & 1 \\ 2 & -3 \end{vmatrix} = [2 \times (-3)] - [2 \times (1)] = -6 - (2) = -6 - 2 = -8$

$D_x = \begin{vmatrix} 19 & 1 \\ -3 & -3 \end{vmatrix} = [19 \times (-3)] \times (1)] = -57 - (-3) = -54$

$D_y = \begin{vmatrix} 2 & 19 \\ 2 & -3 \end{vmatrix} = [(2) \times ((-3)] - [(19) \times (2)] = (-6) - 38 = -44$

By Cramer's Rule –

$x = \frac{D_x}{D}$ $\qquad$ $y = \frac{D_y}{D}$

$\therefore$ $x = \frac{-54}{-8} = 6.75$ $\qquad$ $\therefore y = \frac{-44}{-8} = 5.5$

$\therefore$ $(x,y) = (6.75, 5.5)$ is the solution of the given equations.