Marking Schemes
form 3
End term III
Section I (Answer all questions in this section)

① (4mks)

| No | Std | log |
|---|---|---|
| 0.8423 | $8.423 \times 10^{-1}$ | 1.9255 |
| 72.5 | $7.25 \times 10^{1}$ | 1.8603 |
| | | 1.7858 |
| 930.5 | $9.305 \times 10^{2}$ | 2.9687 |
| | | 2.8171 |

$$\frac{2.8171}{3} = 3 + \frac{1.8171}{3}$$

0.4033 $\quad 4.033 \times 10^{-1} \quad -1.6057$

② (3mks)

$r = \frac{16}{4} = 4\%$
$n = ?$
$p = 15,000$
$A = 24,015.50$
$A = p(1 + \frac{r}{100})^n$

$$\frac{24015.50}{15000} = \frac{15000}{15000}(1 + \frac{4}{100})^n$$

$$1.60103 = (1.04)^n$$

$$\log(1.60103) = n \log 1.04$$

$$n = \frac{\log 1.60103}{\log 1.04}$$

$n = 12.00 = \frac{12}{4} = 3$ years

③ (3mks)

| | Juma | Ali |
|---|---|---|
| 3 yrs ago | $3x$ | $x$ |
| Now | $3x+3$ | $x+3$ |
| 2 yrs time | $3x+5$ | $x+5$ |

$x + 5 + 3x + 5 = 62$
$4x + 10 = 62$
$4x = 62 - 10$
$\frac{4x}{4} = \frac{52}{4}$
$x = 13$

Ali $= 13 + 3 = 16$ yrs
Juma $= 39 + 3 = 42$ yrs.

(3 mks)

(4) $\frac{11}{4} - \frac{1}{2} = \frac{11-22}{4} = \frac{-11}{4}$

$\frac{1}{3} \times \frac{-11}{4} = \frac{-11}{12}$

$\frac{22}{7} \times \frac{4}{9} = \frac{12}{7}$

$\frac{-11}{12} \times \frac{12}{7} = \frac{-11}{7}$.

(5) $h = \sqrt{26^2 - 24^2} = 10\text{cm}$ (2mks)

(6) (a) $\frac{y--3}{x--1} = -\frac{1}{2}$

$2y + 6 = -x - 1$

$2y = -x - 7$

$y = \frac{-x}{2} - \frac{7}{2}$ (2mks)

(b) $m_2 = \frac{5--3}{4-1} = \frac{8}{3}$

$\frac{8}{3} = \frac{y-5}{x-4}$

$8x - 32 = 3y - 15$

$y = \frac{8}{3}x - \frac{17}{3}$ (2mks)

(7) $x^2 - \frac{5}{2}x + \frac{3}{2} = 0$

$x^2 - \frac{5}{2}x + \left(\frac{5}{4}\right)^2 = -\frac{3}{2} + \frac{25}{16}$

$\left(x - \frac{5}{4}\right)^2 = \frac{-24+25}{16} = \frac{1}{16}$

$x = \frac{5}{4} \pm \frac{1}{4}$

$= \frac{4}{4}$ or $\frac{6}{4}$

$x = 1$ or $\frac{3}{2}$ (3mks)

(8) $\frac{3nk}{x^2 T^2} = \frac{4m^2}{n^2} \cdot \frac{L - A}{3k} \times 3k$

$-A = \frac{3^2 n^2 k T^2}{4m^2} - L$

$A = L - \frac{3n^2 k T^2}{4m^2}$. (3mks)

(9) Let RB = x cm

$4 \times x = 5 \times 3$

$4x = 15$

$x = 3.75$ cm

$AB = AR + RB$

$AB = 4 + 3.75$

$= 7.75$ cm. (2mks)

(3mks)

(10) $M = \begin{pmatrix} 3 & -5 \\ 5 & 2 \end{pmatrix}$

$\det = (3 \times 2) - (-5 \times 5) = 31$

$M^{-1} = \frac{1}{31}\begin{pmatrix} 2 & 5 \\ -5 & 3 \end{pmatrix}$

$\frac{1}{31}\begin{pmatrix} 2 & 5 \\ -5 & 3 \end{pmatrix}\begin{pmatrix} 3 & -5 \\ 5 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{31}\begin{pmatrix} 2 & 5 \\ -5 & 3 \end{pmatrix}\begin{pmatrix} -9 \\ 16 \end{pmatrix}$

$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $x = 2$

$y = 3$

(11) $\frac{2(x+2) - 1(x-1)}{x^2 + x - 2} = \frac{1}{x}$

$x^2(2x + 4 - x + 1) = x^2 + x - 2$

$x^2 + 5x = x^2 + x - 2$

$4x = -2$

$x = -\frac{1}{2}$ (3mks)

(12) $\log(3x-1) = \log 12 - \log(x-2)$

$\log x - 1 = \log\left(\frac{12}{x-2}\right)$

$(x-2)x(x-1) = \frac{12}{x-2} \times x - 2$

$x^2 - 3x + 2 = 12$

$x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

$x = 5$ or

$x = -2$

$x = 5$ (3mks)

(13) (a) $(1-2x)^5 = 1 - 5(2x) + 10(2x)^2 - 10(2x)^3$

$= 1 - 10x + 40x^2 - 80x^3$ (2mks)

(b) $x = 0.01$

$1 - 2(0.01)^5 = 1 - 10(0.01) + 40(0.01)^2 - 80(0.01)^3$

$= 1 - 0.1 + 0.004 - 0.00008$

$= 0.9039$. (3mks)

(14) Let Cost price (CP) = 100%

Selling price (SP) = CP + profit

= 150%

150% = Sh 81

1% = $\frac{81}{150}$

$\frac{81}{150} \times 100$ = Sh 54 per kg.

A, loss = 60 − 54 = Sh 6

B, gain = 54 − 50 = Sh 4

A : B = 1 : n

$4n = \frac{6}{4_2}$ $n = \frac{3}{2}$

= 1 : $\frac{3}{2}$

= 2 : 3

(15) $p = L + kq^2$ where k and L are constants

$40 = L + k \cdot 2^2$ and $65 = L + k \cdot 3^2$

$L + 4k = 40$ --(i)

$L + 9k = 65$ --(ii)

$5k = 25$ $k = 5$

$L + (4 \times 5) = 40$

$L = 20$

$p = 20 + 5q^2$

When $q = 4$

$p = 20 + 5 \times 4^2$

= 100

(4 marks)

(16) In one minute

$= \frac{6}{6} + \frac{1}{12} - \frac{1}{8} = \frac{1}{8}$

In 3 minutes $\frac{1}{8} \times 3 = \frac{3}{8}$

Remaining $= \frac{5}{8}$

$\frac{1}{6} - \frac{1}{8} = \frac{1}{24}$

$\frac{5}{8} \div \frac{1}{24}$

= 15 minutes.

## Section II (50 mks)

Answer any five questions in this section

**17** Taxable income per month = Sh (15000 + 2400 + 12000)
= Sh 29400

Kshs p.a = $29400 \times \frac{12}{20}$

= Kshs 17640

Tax due

5508 × 2 = 11616
5472 × 3 = 16416
5472 × 4 = 21888
888 × 5 = 4440 +

total tax due Sh 54360
less "personal relief Sh 12672 −
Sh 41688

tax payable p.a
= Sh 41688

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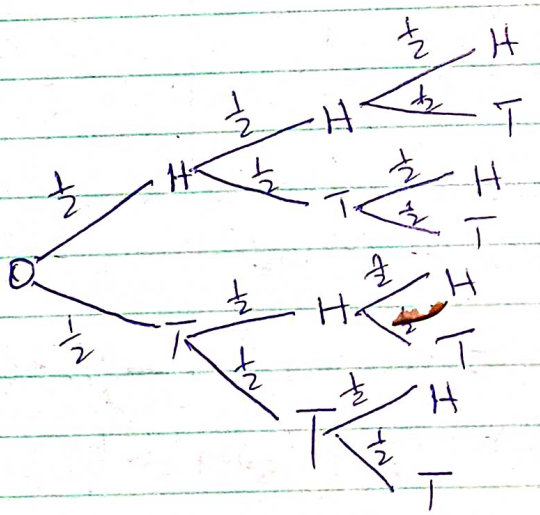
**18**




Outcomes
HHH
HHT
HTH
HTT
THH
THT
TTH
TTT

(3mks)

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(b)(i) p(one head) = p(HTT) + p(THT) + p(TTH)
= $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8}$ (1mks)

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(ii) p(two head & a tail in that order) = p(HHT)
= $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$ (1mks)

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(iii) p(two heads and a tail in any order)
= p(HHT) + p(HTH) + p(THH) (1mks)
= $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8}$

(iv) $P(\text{three heads}) = P(HHH)$
$= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$ (1mks)

(v) $P(\text{at least one head}) = P(1 \text{ or } 2 \text{ or } 3 \text{ heads})$ (1mks)
$= \frac{3}{8} + \frac{3}{8} + \frac{1}{8} = \frac{7}{8}$

(vi) $P(\text{no head}) = P(TTT)$
$= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$ (2mks)

(19) let height of small cone = h.
then height of large cone = h + 20

$\frac{h+20}{h} = \frac{14}{10.5} = \frac{4}{3}$. (5mks)

$3h + 60 = 4h$

$h = 60\text{cm}$.

∴ height of small cone = 60cm
height of large cone = 80cm.

Volume of frustum = V. of large cone − V. of small cone.

$= \frac{1}{3}\pi R^2 \times 80 - \frac{1}{3}\pi r^2 \times 60$

$= \frac{1}{3}\pi (14 \times 14 \times 80 - 10.5 \times 10.5 \times 60)$

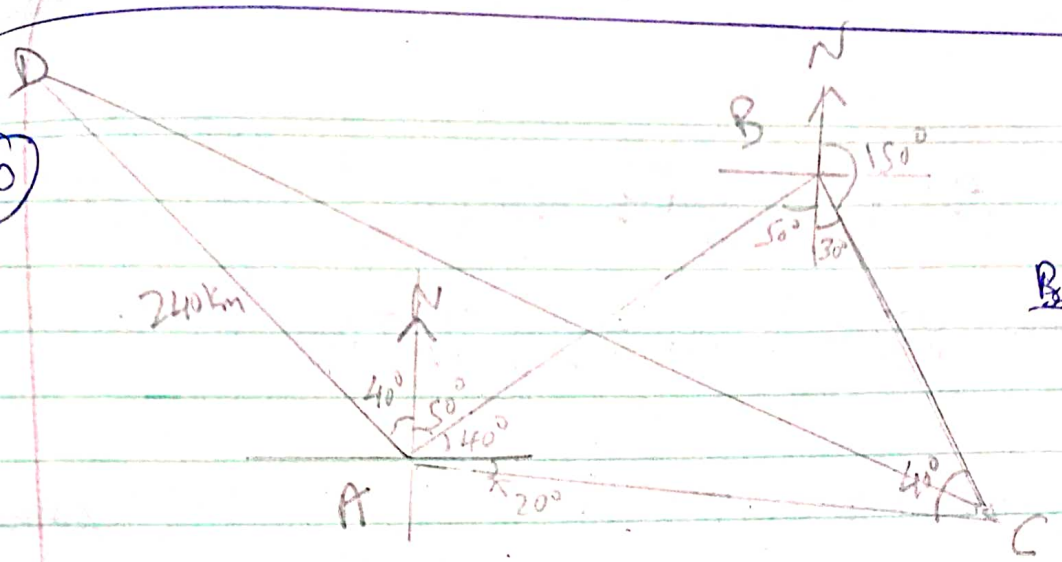
$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 20\,(2 \times 2 \times 4 - 1.5 \times 1.5 \times 5)$ (5mks)

$= \frac{22 \times 140 \times 9.25}{3 \times 1000}$ litres

$= 9.5$ litres

(10mks)

(20)




$B_2$ (2mks)

locating of positions (2mks)

(a) AC = 276 km (2mks)

(b) CD = 499 km (2mks)

(c) BC = 243 km (2mks)

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(21) (i) $SR = SO + OR$

$= -\frac{1}{3}p + \frac{1}{3}q$ (2mks)

$= \frac{1}{3}(q-p)$

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(ii) $QS = QO + OS$

$= -q + \frac{1}{3}p$ (2mks)

$= \frac{1}{3}p - q$

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(iii) $PT = PS + ST$ (2mks)

$= -\frac{2}{3}p - \frac{1}{4}QS$

$= -\frac{2}{3}p - \frac{1}{4}(\frac{1}{3}p - q)$

$= -\frac{2}{3}p - \frac{1}{12}p + \frac{1}{4}q$

$= \frac{1}{4}(q - 3p)$

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(iv) $TR = TS + SR = \frac{1}{4}QS + SR$ (2 mks)

$= \frac{1}{4}(\frac{1}{3}p - q) + \frac{1}{3}(q-p)$

$= \frac{1}{12}p - \frac{1}{4}q + \frac{1}{3}q - p$

$= \frac{1}{12}(q - 3p)$

(b) $\frac{1}{4}(q-3p) = \frac{1}{12}(q-3p)$ (2MKS)

hence $PT = 3TR \Rightarrow PT // TR$

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(22) $S_8 = \frac{n}{2}(2a+(n-1)d)$ 2MKS)

(i) $240 = \frac{8}{2}(2\times2)+(8-1)d$

$240 = 4(4+7d$

$240 = 16+28d$

$d = 8$

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(ii) $2\times1560 = n/2 \cdot (2\times2)+(n-1)8$

$3120 = n(4+8n-8)$

$2n^2-n-780 = 0$

$n = 40$ terms

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b(i) $a+2d, a+4d, a+7d$ ---GP

$\frac{a+4d}{a+2d} = \frac{a+7d}{a+4d}$

$a^2+8ad+16d^2 = a^2+9ad+14d^2$

$16d^2-14d^2 = 9ad-8ad$

$\frac{2d^2}{d} = \frac{ad}{d}$

$a = 6.$

GP formed

$6+6, 6+12, 6+21$

$12, 18, 27 - - - -$

first term GP $= 12$

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(ii) $C.R = \frac{18}{12} = \frac{3}{2}$

$S_n = \frac{a(r^n-1)}{r-1}$

$S_9 = 12\frac{(1.5^9-1)}{1.5-1} = 898.6$

(4mks)

(23) @ BS = 20000 $C = \frac{8}{100} \times x$

January 2010 = 48000

48000 − 20000

Commission = Sh 28000

$28000 = \frac{8}{100} \times x$

$\frac{100}{8} \cdot \times 28000 = 350,000$

350000 + 100000

= Sh 450000

(b) (i) $450000 \times \frac{118}{100}$

= 531000

$C = \frac{8}{100} \times (531000 - 100000)$

$\frac{8}{100} \times 431000$

C = Sh 34480

(ii) $531000 \times \frac{75}{100} = 398250$

= 398250 − 100000

= 298250

$= \frac{8}{100} \times 298250$

C = 23860 + 20,000

= Sh 43860

(24) @ $A = P\left(1 + \frac{r}{100}\right)^n$ (2mks)

$= 1240000\left(1 + \frac{12}{100}\right)^9$

= 1,240,000 × 2.773

= Sh 3438,618

(b) (i) $A = P(1 + \frac{r}{100})^n$ (4mks)

$2741245 = 1240000\left(1 + \frac{12}{100}\right)^n$

$2.211 = (1.12)^n$

$\log 2.211 = \log 1.12^n$

$\log 2.211 = n \log 1.12$

$n = \frac{0.3445}{0.0492}$

$n = 7$ years.

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(ii) $2917231 = 1240000\left(1 + \frac{r}{100}\right)^7$ (4mks)

$2.3526 = \left(1 + \frac{r}{100}\right)^7$

$\sqrt[7]{2.3526} = 1 + \frac{r}{100}$

$1.13 - 1 = \frac{r}{100}$

$0.13 = \frac{r}{100}$

$r = 13\%$ p.a

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