GRADE 12 EXAMINATION
NOVEMBER 2009

ADVANCED PROGRAMME MATHEMATICS

MARKING GUIDELINES

Time: 3 hours | 300 marks

These marking guidelines were used as the basis for the official IEB marking session. They were prepared for use by examiners and sub-examiners, all of whom were required to attend a rigorous standardisation meeting to ensure that the guidelines were consistently and fairly interpreted and applied in the marking of candidates' scripts.

At standardisation meetings, decisions are taken regarding the allocation of marks in the interests of fairness to all candidates in the context of an entirely summative assessment.

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Please note that learners who provided alternate correct responses to those given in the marking guidelines will have been given full credit.

MODULE 1 CALCULUS AND ALGEBRA

QUESTION 1

Let n = 1 : $3^1 + 3^2 + 3^3 = 39$

39 is divisible by 13

$\therefore$ Statement is true for n = 1

Assume statement true for n = k :

$3^k + 3^{k+1} + 3^{k+2}$ is divisible by 13 (or = 13p, p0Z)

Let n = k + 1 :

$3^{k+1} + 3^{k+2} + 3^{k+3}$

$= 3.3^k + 3.3^{k+1} + 3.3^{k+2}$

$= 3(3^k + 3^{k+1} + 3^{k+2})$ which is divisible by 13

$= 3.13p$

$\therefore$ If the statement is true for n = k, it is also true for n = k + 1. $\therefore$ Statement true for n0N

13 marks

QUESTION 2

2.1 (a) $x = e^{y+2} - 1$

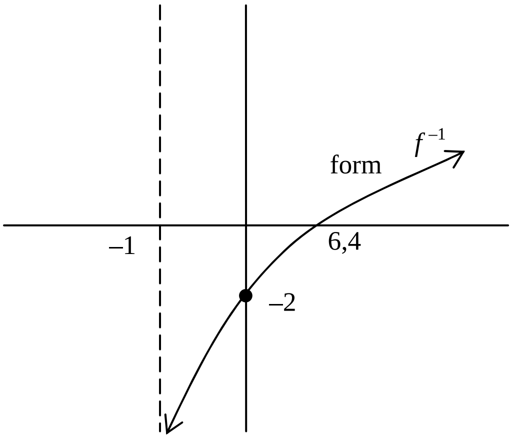
$x + 1 = e^{y+2}$

$\therefore y + 2 = ln|x+1|$

$y = ln|x+1| - 2$

$f^{-1}(x) = ln|x+1| - 2$ (4)

2.1 (b)



$x - \text{int}: ln|x+1| = 2$

$x + 1 = e^2$

$x = e^2 - 1$

$= 6{,}4$

$y - \text{int}: \ \ln|1| - 2 = -2$

(9)

2.2 (a) Squaring: $x + iy = a^2 + 2abi + i^2b^2$

$= a^2 + 2abi - b^2$

$\therefore x = a^2 - b^2$ and $y = 2ab$ (5)

2.2 (b) $\sqrt{x+iy} = 5i - 12$

$\therefore x = (-12)^2 - 5^2$

$= 119$

and $y = 2(5)(-12)$

$= -120$ (4)

2.3 $\dfrac{1}{4-x^2} = \dfrac{1}{(2-x)(2+x)} = \dfrac{A}{2-x} + \dfrac{B}{2+x}$

(Any method) $1 = A(2+x) + B(2-x)$

$x = 2$: $1 = 4A$

$\therefore A = \dfrac{1}{4}$

$x = -2$: $1 = 4B$

$\therefore B = \dfrac{1}{4}$

$\therefore \dfrac{1}{4(2-x)} + \dfrac{1}{4(2+x)}$

or

$\dfrac{-1}{x^2-4} = \dfrac{-1}{(x-2)(x+2)}$

$= \dfrac{A}{x-2} + \dfrac{B}{x+2}$

$\therefore -1 = A(x+2) + B(x-2)$

$x = 2 - 1 = 4A$

$A = \dfrac{-1}{4}$

$x = -2 \ \therefore -1 = -4B$

$B = \dfrac{1}{4}$ (9)

$\therefore \dfrac{-1}{4(x-2)} + \dfrac{1}{4(x+2)}$

31 marks

QUESTION 3

3.1 $(x-1+2\text{i})\,(x-1-2\text{i})$ factor

$= (x-1)^2 - (2i)^2$

$= x^2 - 2x + 1 - 4i^2$

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

$= x^2 - 2x + 5$ (4)

3.2

			1	−4	5		
1	−2	5)	1	−6	18	−30	25
			1	−2	5		
				−4	13	−30	
				−4	8	−20	
					5	−10	25
					5	−10	25

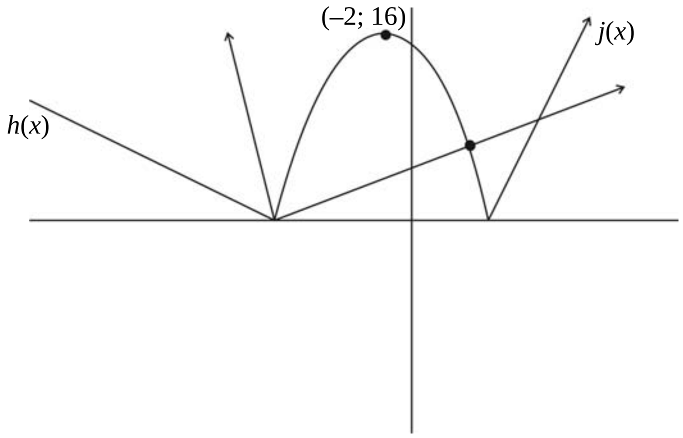
$\therefore\ (x^2 - 4x + 5)$ (or any other method.)

$x = 2 + i$ or $x = 2 - i$ (11)

15 marks

QUESTION 4

4.1



(6)

4.2 $-x^2 - 4x + 12 = x + 6$

$x^2 + 5x - 6 = 0$

$(x+6)\,(x-1) = 0$

$x = 1$

$y = 7$

$\therefore\ (1\ ;\ 7)$ (7)

13 marks

QUESTION 5

5.1 $\lim_{x \to -1^-} h(x) = \lim_{x \to -1^+} h(x)$

$\lim_{x \to -1^-} \left(2x + x^2 - 3\right) = \lim_{x \to -1^+} -x + k$

$2(-1)^3 + (-1)^2 - 3 = -(-1) + k$

$k = -5$ (6)

5.2 $\lim_{x \to -1^-} h^1(x) = \lim_{x \to -1^-} \left(6x^2 + 2x\right)$

$= 6(-1)^2 + 2(-1) = 4$

$\therefore \lim_{x \to -1} h^1(x) = \lim_{x \to -1^+} (-1) = -1$

$\therefore \lim_{x \to -1^-} h^1(x) \neq \lim_{x \to -1^+} h^1(x)$

$\therefore$ Not diff.b. (8)

14 marks

QUESTION 6

6.1 Dist : $3 \sin 4x - \frac{1}{2}(x+1)^2 + 6$

Max if (Dist)' = 0

$12 \cos 4x - (x + 1) + 0 = 0$

$12 \cos 4x = x + 1$ (6)

6.2 Let $D(x) = x + 1 - 12 \cos 4x$

$D'(x) = 1 + 48 \sin 4x$

$\therefore \quad x_{n+1} = x_n - \dfrac{x_n + 1 - 12\cos 4x_n}{1 + 48 \sin 4x_n}$

$x_0 = 0{,}5$
$x_1 = 0{,}354550$
$x_2 = 0{,}364242$
$x_3 = 0{,}364216$
$x_4 = 0{,}364216$
$\therefore x \approx 0{,}36422$

(9)

15 marks

QUESTION 7

$f(x) = \dfrac{2(x-1)\ (x+2)}{(x-7)\ (x+1)}$ (6)

6 marks

QUESTION 8

8.1 $f^1(x) = \cos\left(\tan(2x)\right).\sec^2(2x).2$ (3)

$g^1(x) = \dfrac{2}{3}x^{-\frac{1}{3}}(x+\sqrt[4]{x}) + x^{\frac{2}{3}}\left(1+\dfrac{1}{4}x^{-\frac{3}{4}}\right)$

OR

$g(x) = x^{\frac{5}{3}} + x^{\frac{11}{12}}$

$g^1(x) = \dfrac{5}{3}x^{\frac{2}{3}} + \dfrac{11}{12}x^{-\frac{1}{12}}$ (3)

$h^1(x) = \dfrac{2\cos 2x + 2x\sin 2x.2}{(\cos 2x)^2}$ (4)

8.2 $f^1(\pi) = 2$ $g^1(1) = 2{,}583$ or $\dfrac{31}{12}$

$h^1\left(\dfrac{\pi}{2}\right) = -2$

$\therefore\ g^1(1)\ ;\ f^1(\pi)\ ;\ h^1\left(\dfrac{\pi}{2}\right)$ (4)

14 marks

QUESTION 9

9.1 $2x - 4y - 4x.\frac{dy}{dx} + 4\frac{dy}{dx} + 0 = 0$

$2.\frac{dy}{dx} - 2x\frac{dy}{dx} = 2y - x$

$\frac{dy}{dx}(2 - 2x) = 2y - x$

$\frac{dy}{dx} = \frac{2y - x}{2 - 2x}$ (9)

9.2 $\frac{dy}{dx} = 0 \quad \therefore 2y - x = 0$

$2y = x$

Subst: $(2y)^2 - 4(2y).y + 4y + 8 = 0$

$4y^2 - 8y^2 + 4y + 8 = 0$

$-4y^2 + 4y + 8 = 0$

$y^2 - y - 2 = 0$

$(y - 2)(y + 1) = 0$

$y = 2$ or $y = -1$

$\therefore x = 4$ or $x = -2$

$(4;2)$ or $(-2;-1)$ (9)

18 marks

QUESTION 10

10.1 Damon used $\int fg^1 = fg - \int f^1 g$

and chose $g'(x) = x$ and $f(x) = \cos 2x$ (4)

10.2 Choose $g^1(x) = \cos 2x$ and $f(x) = x$ (2)

10.3 $\int x\cos 2x\,dx = x.\left(\frac{\sin 2x}{2}\right) - \int\left(\frac{\sin 2x}{2}.1\right)dx$

$= \frac{x\sin 2x}{2} + \frac{\cos 2x}{4} + C$ (6)

12 marks

QUESTION 11

11.1 (a) $\int 1(1-5x)^{-\frac{1}{2}}\ dx \ = \ \dfrac{(1-5x)^{\frac{1}{2}}}{\frac{1}{2}.-5} \ + \ C$ (5)

11.1 (b) $\frac{1}{2}\int 2\left(\sin 9x \ + \ \sin(-x)\right) dx$

$= -\dfrac{\cos 9x}{9} \ - \ \dfrac{\cos(-x)}{-1} \ + \ C$ (6)

11.2 (a) LHS $= \dfrac{1-\sin x+1+\sin x}{(1+\sin x)(1-\sin x)}$

$= \dfrac{2}{1-\sin^2 x}$

$= \dfrac{2}{\cos^2 x}$

$= 2\sec^2 x \quad = \quad$ R.H.S. (6)

11.2 (b)

$\int_0^a 2\sec^2 x\,dx \ = \ \dfrac{2\sqrt{3}}{3}$

$2\tan x\,]_0^a \ = \ \dfrac{2\sqrt{3}}{3}$

$\tan a - \tan 0 = \dfrac{\sqrt{3}}{3}$

$\tan a = \dfrac{\sqrt{3}}{3}$

$a = \pi/6$ (7)

24 marks

QUESTION 12

12.1 $$\int_0^m \frac{x}{\sqrt{2x^2+1}}\,dx = \frac{\frac{1}{4}\left(2x^2+1\right)^{\frac{1}{2}}\Big|_0^m}{\frac{1}{2}}$$

$$= \frac{1}{2}\sqrt{2x^2+1}\Big|_0^m$$

$$\frac{1}{2}\sqrt{2m^2+1}-\frac{1}{2}$$

OR

Let $u = 2x^2+1$

$$\frac{dy}{dx} = 4x$$

$du = 4x\,dx$

and if $x = m, \quad u = 2m^2+1$

$$\therefore \int_0^{2m^2+1} \frac{1}{4}\,U^{-\frac{1}{2}}\,du$$

$$= \frac{\frac{1}{4}U^{\frac{1}{2}}}{\frac{1}{2}}\Bigg|_0^{2m^2+1}$$

$$= \frac{1}{2}\sqrt{2m^2+1}-\frac{1}{2}$$ (9)

12.2 Area $= \frac{1}{2}\sqrt{2.2^2+1} \quad = \frac{\sqrt{9}}{2}-\frac{1}{2}=1$ (2)

12.3 $V = \pi\int_a^b \left(f(x)\right)^2\,dx$

$$= \pi\int_o^m \frac{x^2}{2x^2+1}\,dx$$ (4)

15 marks

QUESTION 13

13.1 $h(a) = \dfrac{f(a)}{g(a)}$

$\dfrac{-1}{3} = \dfrac{1}{g(a)}$

$g(a) = -3$ (3)

13.2 $h'(a) = \dfrac{f'(a).g(a) - f(a).g'(a)}{(g(a))^2}$

$= \dfrac{2.-3-1.6}{(-3)^6}$

$= \dfrac{-12}{9} = \dfrac{-4}{3}$ (7)

10 marks

Total for Module 1: 200 marks

MODULE 2 STATISTICS

QUESTION 1

1.1 Sample mean $\bar{x} = 69{,}25\% = 0{,}6925$

Population mean $\mu = 70\% = 0{,}7$

Standard deviation $\sigma = 0{,}01$

$H_0 : \mu = 70$

$H_1 : \mu \neq 70$ i.e. two sided test

$$z = \frac{0{,}6925 - 0{,}7}{\frac{0{,}01}{\sqrt{8}}} = -2{,}121$$

Two sided $\therefore$ critical value = $\pm 1{,}96$

$\therefore$ Accept alternative hypothesis i.e. reject claim

(10)

1.2 99% CI: $\left(0{,}6925 \pm 2{,}576\frac{0{,}01}{\sqrt{8}}\right)$

$(0{,}6925 \pm 0{,}0091))$

$\therefore$ (68,34%: 70,16%)

(8)

18 marks

QUESTION 2

Using a calculator the following should be determined

A = 11,6764 B = 0,9806 r = 0,8823

2.1 (a) r = 0,8823 (6)

(b) relatively strong positive (3)

2.2 (a) $F = -11{,}6764 + 0{,}9806I$ (5)

(b) Prashail = – 11,6764 + 0,9806 × 85 – 71,6746 (3)

Shosho = – 11,6764 + 0,9806 × 64 = 51,082 (2)

(c) Prashail is interpolation whilst Shosho is extrapolation (2)

$\therefore$ Prashail more reliable (1)

2.3 (a) Use calculators $\bar{i} = 86{,}714$ and $\sigma = 5{,}57$ (3)

(b) Student 7 (2)

(c) If it is removed the **strength** of the linear relationship changes quite dramatically (from r=0.88 to r=0.67) and gets **weaker**.

y = 0,9806(70) – 11,6764 . 57 which is very close to the 56 given. (5)

23 marks

QUESTION 3

3.1 (a) Defective balls = $0,04 \times 500 = 20$ (2)

(b) Let X = the number of defective balls

$$P(x=0)=\frac{\binom{20}{0}\binom{480}{20}}{\binom{500}{20}}=0,43487$$

$$P(x=1)=\frac{\binom{20}{1}\binom{480}{19}}{\binom{500}{20}}=0,37733$$

0,43487 + 0,37733

Thus a 81,22% chance of being accepted (10)

3.2 X has a binomial distribution X – Bin (20;0,15)

$\therefore P(x=6) = {}^{20}C_6 \times 0{,}15^6 \times (1-0{,}15)^{14} = 0{,}04537$

Or 4,5 % chance of needing 6 bats to be replaced (10)

3.3 X has a normal distribution X – N (80; 15)

$\therefore P(x>90) = P\left(z > \dfrac{90-80}{\sqrt{15}}\right) = P(z > 2{,}582)$

0,5 – 0,49506 = 0,00494 thus 0,49 % chance of an arm length of more than 90 cm. (8)

30 marks

QUESTION 4

4.1 $P(B|A) = \dfrac{P(A \cap B)}{P(A)}$

$\therefore \dfrac{1}{4} \times P(A) = P(A \cap B)$ (5)

4.2 $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$

$\therefore \dfrac{2}{5} \times P(B) = P(A \cap B)$ (3)

4.3 $\therefore \dfrac{1}{4} \times P(A) = \dfrac{2}{5} \times P(B)$

$\therefore P(B) = \dfrac{5}{8} P(A)$

$\therefore \dfrac{11}{20} = P(A) + \dfrac{5}{8} P(A) - \dfrac{1}{4} P(A)$

$\therefore P(A) = \dfrac{2}{5}$ (9)

4.4 $P(A \cap B) = \dfrac{1}{4} \times P(A) = \dfrac{1}{4} \times \dfrac{2}{5} = 0{,}1$ (3)

20 marks

Total for Module 2: 100 marks

MODULE 3 FINANCE AND MODELLING

QUESTION 1

1.1 $(1 + i)^4 = (1{,}11)(1{,}087)(1{,}065)(1{,}082)$

$\therefore\ 1 + i = \sqrt[4]{1.39036}$

$i = 8{,}59\%$ (7)

1.2 (a) $125\ 000 = x\left[\dfrac{1-(1+i)^{-54}}{i}\right]$ where $i = \dfrac{0{,}13}{12}$

$\therefore\ x = \text{R}3\,069{,}71$ (7)

(b) Balance outstanding = (loan+interest)-(payments+interest)

$= 125\ 000(1+i)^{24} - 3\,069{,}71\left[\dfrac{(1+i)^{24}-1}{i}\right]$

$= 161\,889{,}74 - 83\,623{,}98$

= R 78 265,76

Or Balance outstanding = present value of outstanding payments

$= 3\ 069{,}71\left[\dfrac{1-(1+i)^{54-24}}{i}\right]$

= R 78 265,90 (8)

22 marks

QUESTION 2

2.1 $n = 30 \times 12 = 360$

$i = \dfrac{0.07}{12}$

$x = R1000$

$FV = 1000 \times \left(\dfrac{(1+i)^{360} - 1)}{i}\right) = 1219971$ (7)

2.2 $FV = 1000 \times \left(\dfrac{(1+i)^{8} - 1}{i}\right)$

$FV \times (1 + i)^{52} = R11\ 049$ (10)

2.3 $A = 0{,}3 \times 1\,219\,971 = R365\,991{,}30$ (1)

2.4 $PV = 1\ 219\ 971 - 365\ 991{,}30 = R853\ 979{,}70$

$i = \dfrac{0{,}08}{12}$

$n = 25 \times 12 = 300$

$853\ 979{,}70 = x \times \left(\dfrac{1 - (1+i)^{-300}}{i} \right)$

$\therefore\ x = R6\ 591{,}15$ (8)

26 marks

QUESTION 3

3.1 $T_k = T_{k-1} \times \left(1 + \dfrac{0{,}09}{12} \right) + 1\ 000 \times 1{,}01^{k-1}$ (8)

3.2 $T_1 = 20\ 000 \times \left(1 + \dfrac{0{,}09}{12} \right) + 1\ 000 \times 1{,}01^0 = 21\,150$

$T_2 = 21\,150 \times \left(1 + \dfrac{0{,}09}{12} \right) + 1\ 000 \times 1{,}01^1 = 22\ 318{,}63$

$T_3 = 22\ 318{,}63 \times \left(1 + \dfrac{0{,}09}{12} \right) + 1\ 000 \times 1{,}01^2 = 23\ 506{,}12$ (5)

13 marks

QUESTION 4

4.1 $a = 0{,}25$ intrinsic growth rate of krill
p = 500 carrying capacity of krill (5)

4.2 c is the death rate $\frac{1}{50}$ of whales dies every year thus $c = \frac{1}{50} = 0{,}02$ (3)

4.3 Krill decreases rapidly to this point as its population is above the carrying capacity. At A it reaches sustainable population but there are some whales thus population continues to decrease but very slowly. (3)

4.4 ± 300 tons/ acre (2)

4.5 Stable population's ± 100 tons krill/ acre
± 480 000 whales (2)

4.6 $K_n = K_n + 0{,}1\,K_n\left(1 - \frac{K_n}{500}\right) - bK_nW_n$

$W_n = W_n + fbW_nK_n - cW_n$

$\therefore W_n\left(500 \times 4{,}3 \times 10^{-7}\ K_n - 0{,}02\right) = 0$

$\therefore K_n = 93{,}02$ tons/ acre

And $0{,}1\ K_n\left(1 - \frac{K_n}{500}\right) - 4{,}3 \times 10^{-7}\ K_nW_n = 0$

$\therefore W_n = 189\ 291{,}5$ whales (12)

27 marks

QUESTION 5

5.1 150 rabbits (1)

5.2 Population A – more rapid growth (2)

5.3 From 0 to 5 months population doubles, i.e. from 10 to 20 rabbits
$\therefore (1+i)^5 = 2$
$\therefore i = 14{,}87\% \approx 15\%$ per month (7)

5.4 Grows to rapidly so overshoots stable population therefore starts to decline again. Keeps oscillating until population stabilises. (2)

12 marks

Total for Module 3: 100 marks

MODULE 4 GRAPH THEORY AND MATRICES

QUESTION 1

1.1 Fifth degree rotational symmetry $\therefore \frac{360°}{5} = 72°$

$$\begin{pmatrix} \cos 72° & -\sin 72° \\ \sin 72° & \cos 72° \end{pmatrix}\begin{pmatrix} 4 \\ 0 \end{pmatrix} = \begin{pmatrix} 1,236 \\ 3,804 \end{pmatrix}$$ (6)

1.2 (a) Stretch by factor 2,5 parallel to x-axis, invariant y-axis (2)

(b) $\begin{pmatrix} 2,5 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 4 \\ 0 \end{pmatrix} = \begin{pmatrix} 10 \\ 0 \end{pmatrix}$ Therefore the new coordinates are (10 ; 0) (3)

1.3 No. Petals will not all be same shape.

$$\begin{pmatrix} 2,5 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} \cos 72° & -\sin 72° \\ \sin 72° & \cos 72° \end{pmatrix} \neq \begin{pmatrix} \cos 72° & -\sin 72° \\ \sin 72° & \cos 72° \end{pmatrix}\begin{pmatrix} 2,5 & 0 \\ 0 & 1 \end{pmatrix}$$ (4)

15 marks

QUESTION 2

2.1 Stretch parallel to *x*-axis $\begin{pmatrix} 2,5 & 0 \\ 0 & 1 \end{pmatrix}$ (4)

2.2 Reflection about *x*-axis $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ (2)

2.3 Need to reflect then multiply by inverse of stretch.

$$\begin{pmatrix} 0,4 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} = \begin{pmatrix} 0,4 & 0 \\ 0 & -1 \end{pmatrix}$$ (8)

14 marks

QUESTION 3

3.1 det P = $1\begin{vmatrix}4 & 3a\\1 & 2\end{vmatrix} - a\begin{vmatrix}a & 3a\\3 & 2\end{vmatrix} + 1\begin{vmatrix}a & 4\\3 & 1\end{vmatrix}$

$= (8-3a) - a(2a-9a) + (a-12)$

$= 7a^2 - 2a - 4$

But det P = 20 $\therefore 7a^2 - 2a - 4 = 20$

$\therefore (7a+12)(a-2) = 0$

$\therefore a = 2$ since a is an integer. (10)

10 marks

QUESTION 4

4.1 $\left(\begin{array}{ccc|c}1 & -1 & 1 & 10\\0 & 3 & -3 & -27\\0 & 8 & -1 & -23\end{array}\right) = \left(\begin{array}{ccc|c}1 & -1 & 1 & 10\\0 & 1 & -1 & -9\\0 & 0 & -7 & -49\end{array}\right) = \left(\begin{array}{ccc|c}1 & -1 & 1 & 10\\0 & 1 & -1 & -9\\0 & 0 & 1 & 7\end{array}\right)$

$\therefore z = 7$

And $y - z = -9$ $\therefore y = -2$

And $x - y + z = 20$ $\therefore x = 1$ (8)

4.2 (a) $A^{-1} = \dfrac{1}{\det A}.\,adjA = \dfrac{1}{-21}.adjA$

Cofactors matrix = $\begin{pmatrix}+(-7) & -(-1) & +8\\-7 & +7 & -7\\+0 & -3 & +(-3)\end{pmatrix}$

$\therefore A^{-1} = -\dfrac{1}{21}\begin{pmatrix}-7 & -7 & 0\\1 & 7 & -3\\8 & -7 & -3\end{pmatrix}$ (7)

(b) $X = A^{-1}.Y$ (2)

17 marks

QUESTION 5

5.1 AHCGF = 24
ABDEF = 22
$\therefore$ ABCGF < 22
$\therefore x + 17 < 22$
$\therefore x < 5$ thus maximum value of $x = 4$ (10)

5.2 (a) H; C; D and G (3)

(b)

Pairs	Weight
HC and DG	6 + 10 = 16
HG and DC	10 + 9 = 19
HD and CG	15 + 4 = 19

$\therefore$ Need to duplicate HC and GE and DE (7)

20 marks

QUESTION 6

6.1 Kruskal's: remove JHB
Select shortest edges to form MST (NB no circuits)
$\therefore$ Select:

PE	–	EL	: 650
EL	–	DBN	: 950
CT	–	PE	: 1200
CT	–	BLM	: 1400
DBN	–	NEL	: 1400
BLM	–	WIND	: 2700

Then include edges: JHB – BLM : 700
JHB – DBN : 800
$\therefore$ Lower bound = R 9 800 (9)

6.2 (a) No. Same edges selected (2)

(b) Yes. The lower bound would be R 8850 (4)

6.3

JHB	–	BLM	: 700
BLM	–	CT	: 1400
CT	–	PE	: 1200
PE	–	EL	: 650
EL	–	DBN	: 950
DBN	–	NEL	: 1400
NEL	–	WIND	: 3600
Back to		JHB	: 2400

TOTAL: R 12 300 (9)

24 marks

Total for Module 4: 100 marks

Total: 300 marks