SECTIONA Attempt all questions (55marks)

1. 2. The function f is given by $f(x) = ax^2 - b$.

if(2) = 5 and f(-1) = 2. Find the value of **a** and **b** hence find (-4)(4marks)

2. The cubic polynomial $6x^3 + 7x^2 + ax + b$ has a remainder of 72 when divided by x - 2 and is exactly divisible x + 1. Find the value of **a** and **b** (5marks)

3. Simplify completely without using a calculator:

a)
$$(2^{-3} \times 16^{1/2}) \div (81^{3/4} \times 27^{-1/3})$$
 (3marks)

b) Find
$$f = 3^x \div 3^2 = 27$$

4. State whether this $\lim_{x\to 3} f(x)$ exist or not for $f(x) = \begin{cases} x^2 - 5 & \text{if } x \le 3 \\ \sqrt{x + 13} & \text{if } x > 3 \end{cases}$

(4marks)

5. The operation T is defined in IR by $xTy = x + y + \frac{1}{2}$

a) find the identity element.

b) Find the inverse of -3 under operation T

c) Find the value of x if (xT1)Tx = 5

6. A person standing on the bank of a river and observes that the angle subtended by a tree on the opposite bank is 60°. When he retreats 40m from the bank, he finds the angle to be 30°. Find the height of the tree and the breadth of the river. (3marks)

7. Peter has 23 coins in his pocket. Some of them are 5 Francs coins and the rest are 10 Francs coins.

The total value of coins is 205 Francs. Find the number of 10 Francs coins and the number of 5 Francs coins. (5marks)

8. Solve the following inequality in set of real number.

$$\frac{x^2 - 5x + 6}{x^2 + 1} > 0 \tag{3marks}$$

9. Solve triangle with the following measurements:

 $A = 52^{\circ}, a = 6cm, B = 67^{\circ}$

10. Find the value of K for which $2x^2 + (k + 2) + 8 = 0$ has exactly one solution and deduce the solution. (4marks)

(2marks)

(2marks)

(2marks)

(**3marks**)

5marks

11. Given that
$$\log 2 = 0.30$$
, $\log 3 = 0.48$, $\log 5 = 0.69$. Calculate : $\log 150$ (2marks)

12. use the definition to find the derivative for
$$f(t) = \frac{t}{t+1}$$
 (2marks)

13. Rationalize the denominator
$$\frac{2\sqrt{2}}{4+3\sqrt{3}}$$
 (2marks)

14. Simplify
$$\left(\frac{1}{tanx} + \frac{1}{cotx}\right)inx cosx$$
 (2marks)

(2marks)

(6marks)

15. Find the inverse of
$$f(x) = \frac{2x+3}{x-1}$$

SECTIONB: ATTEMPT ONLY THREE QUESTIONS (45MARKS)

16. Given the function $(x) = \frac{x^2 + x + 3}{x + 1}$ a) Determine the domain of definition of f(x) (3marks)

b) Determine the real numbers **a**, **b** and **c** such that

$$f(x) = ax + b + \frac{c}{x+1}$$
(6marks)

c) Find all possible asymptotes.

17. a) Calculate the value of the real number P such that the function f is defined by

$$f(x) = \{ \frac{\frac{(x-3)(x^2-4)}{x^3-8}}{p-\frac{1}{3}} \text{ for } x \neq 2 \\ \text{for } x = 2 \end{cases}$$
(7marks)

b) Determine the polynomial function of the **third** degree such that (1) = 7, f'(-1) =10, "(2) = 8, f'''(15) = 6 (8marks)

18.a) Given the function $f(x) = 2x^2 - mx - 3$. Find the real number m such that the tangent to the curve at x = -1 is parallel to the line $L \equiv 2x + y + 5 = 0$. Find also the equation of that tangent. (5marks)

b) Given the polynomial function $P(x) = x^3 - 2x^2 - 5x + 6$

i) Factorize the polynomial P(x) (5marks)

ii) Solve
$$P(x) = 0$$
 (5marks)

.Given the functions $(X) = x^3 + 3x^2 - 2x - 2$ and $g(x) = x^2 - x$.

(5marks)

19. Evaluate the following limits:

a) i. $\lim_{x \to 1} \frac{\sqrt{5x-4} - \sqrt{x}}{x-1}$ 5 marks ii. $\lim_{n \to \infty} \sqrt{n^2 + n} - n$ 5 marks b) Let the function f(x) be defined by $f(x) = \begin{cases} \frac{x^2 - 9}{x+3} & x \neq -3 \\ k & x = -3 \end{cases}$ determine the value of k if $(-3) = \lim_{x \to -3} f(x)$ 5 marks

20. Let P, Q and R be three propositions, then verify the following logic propositions

a)
$$P \lor Q \equiv Q \lor P$$
 (\equiv isequivalence) (5marks)
b) $p \land (q \lor r) \equiv (p \land q) \lor (p \land r)$ (10marks)

GOOD LUCK !!!!!!!!