**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 $f \quad 3^x \div 3^2 = 27$ **(2marks)**

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

**(4marks)**

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

a) find the identity element**.** **(2marks)**

b) Find the inverse of -3 under operation T **(2marks)**

c) Find the value of x if $(xT1)Tx = 5$ **(3marks)**

**6.** A person standing on the bank of a river and observes that the angle subtended by a tree on the opposite bank is $60^0$.When he retreats 40m from the bank, he finds the angle to be $30^0$. 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.

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

9. Solve triangle with the following measurements: **5marks**

$$\hat{A} = 52^0, a = 6cm, \hat{B} = 67^0$$

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

**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$(\frac{1}{tanx} + \frac{1}{cotx})inx\ cosx$ **(2marks)**

**(2marks)**

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. **(6marks)**

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

$$f(x) = \begin{cases} \frac{(x-3)(x^2-4)}{x^3-8} & for\ x \neq 2 \\ P - \frac{1}{3} & for\ x = 2 \end{cases}$$ **(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) $P \vee Q \equiv Q \vee P$ ($\equiv$ *isequivalence*) **(5marks)**

b) $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$ **(10marks)**

# GOOD LUCK !!!!!!!