SPECIAL SELECTION TEST

Held: 12th April 1975

TO SELECT TECHNICIAN STAFF FOR TRAINING LEADING TO ELIGIBILITY FOR
PROMOTION AS TELECOMMUNICATIONS TECHNICAL OFFICER IN
THE POSTMASTER-GENERAL'S DEPARTMENT

Paper No. 2

(11.30 a.m. − 1.10 p.m.)

PRACTICAL MATHEMATICS

Time allowed: One and one half hours
Perusal time: Ten minutes

Maximum marks: 100

Pass Conditions:

Minimum mark: 40
Combined mark for Papers 1 & 2: 100

INSTRUCTIONS TO CANDIDATES

1. Write your distinguishing number at the top of the front cover of the answer book provided.

2. This examination paper contains six questions. ATTEMPT FOUR QUESTIONS ONLY. QUESTION 1 IS COMPULSORY. Answer any three from the other five.

3. Write your answer in the answer book provided and hand it in: DO NOT TEAR OUT ANY PAGES.

4. Do all rough working on the blank left hand pages of the answer book.

5. Clarity in setting out the key steps in solutions to problems will be taken into account when allotting marks.

6. Mathematical tables are provided. Slide rules may be used.

(a) Solve for x: $x^2 = 0.1x + 0.06$

(b) A right angled triangle has one side 8.3 cm long and the hypotenuse is 12.4 cm long. What is the length of the other side?

(c) Find the value of $10^6 \div \dfrac{10^4 \times 10^{-2}}{10^3}$

(d) The xth root of a number can be found by dividing the log of the number by x.

　　　If the $\log_{10}$ of N is $\overline{2}.3127$,

　　　evaluate $\sqrt[3]{N}$

(e) Using tables give numerical values for

　　(i) Cos $165° 20'$

　　(ii) Tan $100° 45'$

(f) If the ratio 1 is to x is as the ratio $(x-1)$ is to 1
$$\left[1 : x :: (x-1) : 1 \right]$$, find x.

(g) In the equation $S = \dfrac{Vu}{\sqrt{V^2 + u^2}}$,   make u the subject.

(h) A vector has magnitude 8 units, direction $37°$ East of North. Give its North and East components.

(j) If $\sin \theta$ = A write down an expression in A for $\tan \theta$.

(k) Express angle C in terms of angles A and B .
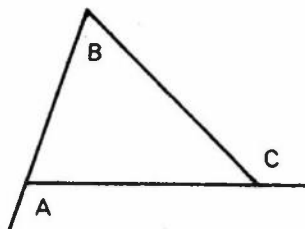
QUESTION 2   (20 marks)

A straight line graph passes through the point (1,1) and has a slope of - 0.5.

A parabola has a minimum point at (0, -3) and x axis intercepts at + 4 and - 4.

(i)   Draw the graphs on common x and y axes.   (4 marks)

(ii)   Deduce and write down the equations for
       both graphs.   (8 marks)

(iii) Show by simplifying the algebraic equation
       the exact values of the graphical intercept
       points.   (8 marks)

(Graph paper included)

QUESTION 3   (20 marks)

A shaft is 1.4 m long and 30 mm in diameter and has a slot cut longitudinally in it to the depth shown in the diagram. The lips of the slot subtend an angle of 40° at the centre. The slot is symmetrical on the centre line. Calculate the volume of material remaining in the shaft after the slot has been cut.
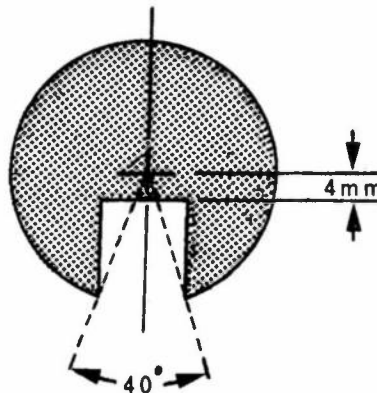

Fig.1

QUESTION 4   (20 marks)

Solve for x and y

$$\log x + \log y = 2$$

$$3x + 2y = 49$$

QUESTION 5   (20 marks)

Fig. 2 shows a rectangle ABCD with the dimensions 10 cm. and 6 cm.
Diagonal BD and line EC intersect at X. Calculate the distance BX
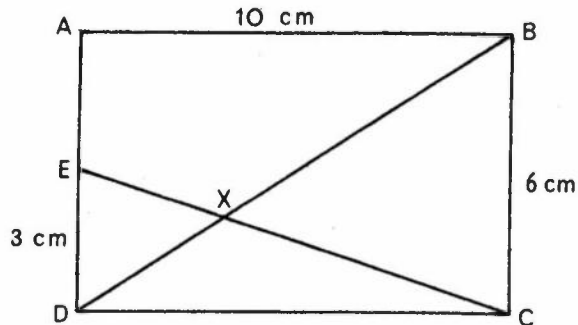(Note : Graphical answer not accepted).

Fig.2

QUESTION 6   (20 marks)

(a) If $\log S + \log t = \log (S + t)$, express t in terms of S
in its simplest form and hence find t when $S = 3$.   (10 marks)

(b) The fuel cost for a ship is $3 per hour when the ship is not moving
and increases by an amount proportional to the cube of its
speed in knots.

If the fuel cost is $6.75 per hour at 15 knots find the fuel
cost for a speed of 30 knots.   (10 marks)