COMBINED COMPETITIVE EXAMINATION (MAIN)

MATHEMATICS

Paper—II

Time : 3 hours *Full Marks* : 200

Note : *(1) The figures in the right-hand margin indicate full marks for the questions.*

(2) Attempt ***five*** *questions in all.*

(3) Question No. ***1*** *is compulsory.*

1. Answer any *ten* questions : 4×10=40

(a) Prove that the function $f(x) = \frac{1}{x}$ is continuous on (0, 1) but not uniformly continuous.

(b) Using differentials, find an approximate value of the square root $\sqrt{25 \cdot 2}$ (up to four decimal places).

(c) Prove that a group G is Abelian if every element of G (except the identity e) is of the order two.

(d) If H is a subgroup of G and N is a normal subgroup of G, show that $H \cap N$ is a normal subgroup of H.

(e) Form the partial differential equation by eliminating a, b from the curve $2z = (ax + y)^2 + b$.

(f) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin although the Cauchy-Riemann equations are satisfied at that point.

(g) Find the bilinear transformation which maps the points $z_1 = 2$, $z_2 = i$ and $z_3 = -2$ into the points $w_1 = 1$, $w_2 = i$ and $w_3 = -1$ respectively.

(h) Convert the following binary numbers to decimal equivalents :

(i) 111100

(ii) 111111