PURE MATHEMATICS JANUARY HOLIDAY ASSESSMENTS

SECTION A (40 MARKS)

Attempt all questions in this section

1. $Find\ y\ if\ log_y 27 - log_{y^2} 81 = 1$ (05 marks)
2. Integrate with respect to x; $\int e^{2x} cosx\ dx$ (05 marks)
3. Find the points of intersection of the curve $x^2 - 3xy + y^2 + 19 = 0$ and the straight line $x - y - 3 = 0$.
4. If $\propto and\ \beta$ are roots of the quadratic equation $x^2 - x - 3 = 0$, find the quadratic equation whose roots are $\frac{1}{(\propto +1)}$ and $\frac{1}{(\beta + 1)}$ (05 marks)
5. Prove that: $tan^{-1}\left(\frac{b}{a+b}\right) + tan^{-1}\left(\frac{a}{a+2b}\right) = \frac{\pi}{3}$. (05 marks)
6. Given that $ye^x = \sin x + \cos x$ show that $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = 0$. (05 marks)
7. Find the equation of the normal to the curve $x^2 - 2xy - 2y^2 + x = 2$ at the point $(-4, 1)$. (05 marks)
8. Find the possible values of y given that:

$$\int_o^y (8x^3 - 27x^2 + 26x - 6)dx = 0$$ (05 marks)

SECTION B

*Attempt only **five** questions from this section*

9. (a) Solve the equation $\cos 7\theta + \cos 5\theta + \cos 3\theta + \cos\theta = 0\ for\ 0^o \leq \theta \leq 360^0$ (06 marks)

   (b) Prove that: $\cos 3\beta = 4cos^3\beta - 3\cos\beta$, hence solve the equation $1 + \cos 3\beta = cos\beta(1 + \cos\beta)\ for\ O^0 \leq \beta \leq 360^0$ (06 marks)

10. Express $\frac{3-x}{(x+1)(x^2+1)}$ in partial fractions and hence differentiate $\frac{3-x}{(x+1)(x^2+1)}$ (12 marks)

11. Fine the values of $x\ and\ y$ in the simultaneous equations;

   (a) $y\log_2 8 = x$, $2^x + 8^y = 8192$ (6mks)

   (b) $\log_2 x + 2\log_4 y = 4$, $x + 12y = 52$ (6mks)

12.) Prove that $\frac{\text{Sin 3A Sin 6A + Sin A Sin 2A}}{\text{Sin 3A Cos 6A + Sin A Cos 2A}}$ = tan 5A 6 mks

   b) Show that $\tan 3\theta = \frac{tan\theta(3-tan^2\theta)}{1-3tan^2\theta}$ 6 mks

13. a) Evaluate i) $\int_0^{\frac{\pi}{2}} sin2\theta cos\theta d\theta$ 4 mks

   ii) $\int x^2 sin2x\ dx$ 4 mks

   iii) $\int_0^2 \frac{8x}{x^2-4x-12} dx$ 4 mks

END