MathCity.org
Merging man and maths

Written Test Lecturer 2008
PUNJAB PUBLIC SERVICE COMMISSION, LAHORE.
Mathematics , Available online @ http://www.mathcity.org

Time Allowed: 3 hours **Maximum Marks: 100**

NOTE: Attempt any five questions.

Q.1 (a) Prove that any two cyclic groups having the same finite orders are always Isomorphic. **(10 Marks)**

(b) Find all the Conjugacy Classes of the elements of the group G where $G = < a, b : a^3 = b^2 = (ab)^2 = 1 >$ **(10 Marks)**

Q.2 (a) Prove that the function $\bigcup(x, y) = e^x, Cos\, y$ is harmonic and hence obtain its corresponding conjugate. **(12 Marks)**

(b) Discuss the nature of the singularities of the function $f(Z) = Sin\frac{1}{Z}$ **(8 Marks)**

Q.3 (a) Show that a sub-set A of a metric space X is closed if and only if its Complement A' is open. **(10 Marks)**

(b) Prove that every metric space is a Hausdorff Space. **(10 Marks)**

Q.4 (a) A line makes angles of equal magnitudes with the three axes. Find these angles. **(8 Marks)**

(b) Prove that **(12 Marks)**

$$\underline{a} \times (\underline{b} \times \underline{c}) + \underline{b} \times (\underline{c} \times \underline{a}) + \underline{c} \times (\underline{a} \times \underline{b}) = \underline{0}$$

Q.5 (a) Find the equation of the plane passing through the point (5,-3,2) and perpendicular to each of the planes $x - y + z = 0$ and $x + y - z = 6$. **(10 Marks)**

(b) Find the equations of the st. line passing through the point (3,4,5) and intersecting the Z-axis at rt. Angles. **(10 Marks)**

Q.6 (a) Discuss the continuity of the function **(8 Marks)**

$$f(x) = Sin\frac{1}{x},\ x \neq 0$$

$$f(0) = 0$$

(b) A car park is 60 ft. by 140 ft. If each of the measurements is uncertain by 3 inches find the max. uncertainty in the area. **(12 Marks)**

Q.7 (a) Integrate : $\int \frac{dx}{Sin\, x + \tan x}$ **(10 Marks)**

(b) Prove that $\frac{x}{1 + x\tan x}$ is a max. **(10 Marks)**

When $x = Cos\, x$