PUNJAB PUBLIC SERVICE COMMISSION

COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE, ETC - 2016

SUBJECT: MATHEMATICS (PAPER-II)

TIME ALLOWED: THREE HOURS **MAXIMUM MARKS: 100**

NOTE: Attempt FIVE Questions in All. Calculator is allowed.

Q No. 1: (a) Show that the set G of all non-singular matrices of order 2 is a non abelian group under matrix multiplication.

(b) If n is the order of an element of a group G, then $a^n = e$ iff n divides m.

(10+10 Marks)

Q No. 2: (a) Define a convergent sequence $\{X_n\}$ in a metric space (X,d). show that the limit of a convergent sequence in a metric space is unique.

(b) Show that {(1, 2, 2), (-1,0,2), (0,0,1)} is a basis of R^3. Using Gram-schmidt orthonormalization process, transform this basis into an orthonormal basis.

(10+10 Marks)

Q No. 3: a) Show that the vectors (1-i,i) and (2,-1+i) in CxC are linearly dependent over C but linearly independent over R.

b) Determine whether or not the given set of vectors is a basis for RxR (i) {(1,1),(3,1)} (ii) {(1,2-1), (0,3,1),(1,-5,3)}

(10+10 Marks)

Q No. 4: Suppose U and W are distinct four dimensional subspaces of a vector space V of dimension six. Find the possible dimension of U intersection W.

(20 Marks)

Q No. 5: a) Show that a subspace of topological is itself topological space.

b) Prove that cofinite topology is discrete if X is finite.

(10+10 Marks)

Q No. 6: a) Let (X,d) be a metric space and T be a collection of all open subsets of X. Show that T is a topology on X.

b) A topological space is normal iff for any closed set A and an open set U containing A, there is atleast one open set V containing A such that $A \subseteq V \subseteq V \subseteq U$

(10+10 Marks)

Q No. 7: a) Using the row operation, show that the matrix $\begin{bmatrix} 1 & 2 & -3 \\ 1 & -2 & 1 \\ 5 & -2 & -3 \end{bmatrix}$ has no inverse.

b) Solve the system of equations having the given matrices as their augmented matrices.

(10+10 Marks)

Q No. 8: a) Solve the differential equations $(D^3-6D^2+3D+10)y=0$

b) Find the general solution of each of the following:-
$(D^2+3D-4)y=15e^n$

(10+10 Marks)

Q No.5: a) How does the Quality Circle go about to solve the problems it has chosen? How does it deal if problem turns out to be very complex or into broader project?

(10 Marks)

b) What is Pareto principle and inventory optimization? Describe the use of ABC analysis in inventory management? State the formula for annual consumption?

(10 Marks)

Q No.6: A company is involved in the production of two items (X and Y). The resources needed to produce X and Y are twofold, namely machine time for automatic processing and craftsman time for hand finishing. The table below gives the number of minutes required for each item:

		Machine time	Craftsman time
Item	X	13	20
	Y	19	29

The company has 40 hours of machine time available in the next working week but only 35 hours of craftsman time. Machine time is costed at £10 per hour worked and craftsman time is costed at £2 per hour worked. Both machine and craftsman idle times incur no costs. The revenue received for each item produced (all production is sold) is £20 for X and £30 for Y. The company has a specific contract to produce 10 items of X per week for a particular customer.

a) Show that LP formulation will become to maximize Z = 17.1667x + 25.8667y subject to:

- 13x + 19y <= 2400
- 20x + 29y <= 2100
- x >= 10
- x,y>= 0

(10 Marks)

b) Solve this linear program for optimal solution.

(10 Marks)

Q No.7: a) What is Production possibility curve /Production Possibility Frontier (PFF), Show the graph with any two products? Why it is concave shape and what will be the causes for the right shift?

(10 Marks)

b) What is the difference between microeconomics and macroeconomics? Why is it important to study microeconomics?

(10 Marks)

Q No.8: **Choose the Right Answer:**

1) Which of the following is the most effective way to encourage ethical behavior in your organization. **(20 Marks)**

a) Clearly laying out expected behavior in a written policy or code of ethics.
b) Making sure top management sets clear examples of ethical behavior.
c) Punishing those who act unethically.
d) None of These.

2) Legitimate measures taken by management to make a business look as strong as possible at the balance sheet date is called:

a) Objectivity Principle
b) Window Dressing
c) Cost Principle
d) None of These