

Reg. No.:



W6865

Name:

University of Kerala

Third Semester FYUGP Degree Examination, November 2025

Discipline Specific Core Course

MATHEMATICS

UK3DSCMAT202-Group Theory and Probability

Academic Level: 200-299

2024 Admission

Time: 1 Hour 30 Minutes(90 Mins.)

Max. Marks: 42

Part A 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark Each.Answer all questions

Qn.No.	Question	CL	CO
1	State Bayes' theorem.	RE	4
2	Define an abelian group.	RE	2
3	Give an example of a binary operation on Z that is not closed on Z^+ .	UN	1
4	State Cayley's theorem	UN	2
5	Define sample space and give an example	UN	2
6	Write the mean and variance of the standard normal distribution .	UN	4

Part B 8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn.No.	Question	CL	CO
7	Let G be a group. Prove that $(a * b)' = b' * a'$ for all elements a, b in G .	UN	2
8	Give an example of a cyclic group. Prove that every cyclic group is abelian.	UN	2
9	Let X be a normal variable with mean 20 and standard deviation is 5. Find the probability that a) $16 \leq X \leq 22$. b) $X \leq 15$.	AP	4
10	A card is selected from a shuffled deck of cards. What is the probability that the card is (a) either a king or a club? (b) both king ?	AP	3

Qn.No.	Question	CL	CO
	(c) neither a King nor a Club.		

Part C 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options * within each question

Qn.No.	Question	CL	CO
11	A) Let S be the set of all real numbers except -1. Define an operation $*$ on S by $a * b = a + b + ab$ (i) Show that $(S, *)$ is a Group. (ii) Is $(S, *)$ is abelian. (iii) Find the solution of the equation $2 * x * 3 = 7$ in S OR B) 1) Draw the subgroup diagram for Z_6. Find all cyclic subgroups of Z_6. 2) Show that the identity element in a group is unique.	AP	2
12	A) 1) In a family of 6 children, what is the probability that all are girls if at least one is a girl? 2) A coin is tossed 3 times. Find the probability that all are heads in three tosses if it is known that at least one is a head? OR B) If X is a normal variate with mean 20 and standard deviation 5. Find the probability that 1) $16 < X < 22$ 2) $X > 23$ 3) $X < 23$ 4) $0 < X < 23$.	AN	4

Qn.No.	Question	CL	CO
13	A) Prove that S_3 is a group under the operation permutation multiplication. Is S_3 is abelian? Find all subgroups of S_3. OR B) i) Find the number of generators of a cyclic group having order 84 ii) Find the number of generators of elements in the cyclic subgroup of Z_{30} generated by 25	EV	2
14	A) Suppose that boxes of a certain kind of cereal have an average weight of 16 ounces and it is known that 70% of the boxes weigh within 1 ounce of the average. What is the probability that the box you buy weighs less than 14 ounces? OR B) (a) What is the probability that a number n, $1 \leq n \leq 99$, is divisible by both 6 and 10? By either 6 or 10 or both? Also find the probability that the number is divisible by 6 given it is divisible by 10.	CR	4