



"Investing in Africa's Future"

COLLEGE OF ENGINEERING AND APPLIED SCIENCES (CEAS)

NCSC 201: DISCRETE MATHEMATICS

END OF SECOND SEMESTER EXAMINATIONS

APRIL 2025

LECTURER: MR TIMOTHY MAKAMBWA

TIME: 3 HOURS

INSTRUCTIONS

You are required to answer ***any five (5)*** questions from this examination

Start each question on a new page in your answer booklet

Credit will be given to clear and concise illustrations

Each question carries 20 marks

Question One

- a) Several tourists were interviewed on their choice of means of travel. Two-thirds said they travelled by road, $\frac{13}{30}$ by air, and $\frac{4}{15}$ by both air and road. If 20 tourists did not travel by either air or road :
- Represent the information on a Venn diagram
 - How many tourists were
 - Interviewed,
 - Travelled by air only
- [10]
- b) In a certain class, 22 pupils take one or more of Chemistry, Economics and Government. 12 take Economics (E), 8 take Government (G), and 7 take Chemistry(C). Nobody takes Economics and Chemistry and 4 pupils take Economics and Government.
- Using set notation, and the letters indicated above, write down the two statements from the last sentence.
 - Draw a Venn to illustrate this information
 - How many students take
 - Chemistry and Government
 - Government only?
- [10]

Question Two

- a) A committee of 4 boys and 3 girls is to be formed from a club of 10 boys and 8 girls. In how many ways can this be done if a particular boy must be on it? [10]
- b) Given that ${}^nC_6 = {}^{n+1}C_5$. Find the value of n. [10]

Question Three

- i). Show that if n is an integer and $n^3 + 5$ is odd, then n is even using
- A proof by contraposition, [5]
 - A proof by contradiction. [5]
- ii). Prove that if n is an integer and $3n + 2$ is even, then n is even using
- a proof by contraposition, [5]
 - a proof by contradiction. [5]

Question Four

- Consider the two integers 125 and 962.
 - Write down the prime decomposition of each of the two numbers.
 - Find their greatest common divisor.
 - Find their least common multiple.
 - Factorize the number 6469693230.
 - Find gcd (210; 858). Determine integers x and y such that $(210; 858) = 210x + 858y$. Hence give the general solution of the equation in integers x and y.
 - Find gcd (182; 247). Determine integers x and y such that $(182; 247) = 182x + 247y$. Hence give the general solution of the equation in integers x and y.
- [20]

Question Five

- a. In a survey of university students, 64 had taken mathematics course, 94 had taken chemistry course, 58 had taken physics course, 28 had taken mathematics and physics, 26 had taken mathematics and chemistry, 22 had taken chemistry and physics courses, and 14 had taken all the three courses. Find how many had taken one course only.

[6]

- b. In a group of students, 65 play football, 45 play hockey, 42 play cricket, 20 play football and hockey, 25 play football and cricket, 15 play hockey and cricket, and 8 play all three games. Find the total number of students in the group (Assume that each student in the group plays at least one game.)

[6]

- c. In a town 85% of the people speak Tamil, 40% speak English and 20% speak Hindi. Also, 32% speak Tamil and English, 13% speak Tamil and Hindi and 10% speak English and Hindi, find the percentage of people who can speak all three languages.

[8]

Question Six

A number L is called a common multiple of m and n if both m and n divide L . The smallest such L is called the least common multiple of m and n and is denoted by $\text{lcm}(m, n)$

- a. Find the following:

i $\text{lcm}(8, 12)$ [2]

ii $\text{lcm}(20, 30)$ [2]

iii $\text{lcm}(51, 68)$ [2]

iv $\text{lcm}(23, 18)$ [2]

b. Compute $\text{lcm}(301337, 307829)$ [6]

c. Find all m and n where $\text{gcd}(m, n) = 18$ and $\text{lcm}(m, n) = 720$ [6]

Question Seven

- a) Find the 10th term of the A. P.: 2, 4, 6, ...

- b) The 10th term of an A. P. is – 15 and 31st term is –57, find the 15th term.

- c) Find the 6th term of the G. P.: 4, 8, 16, ...

- d) The 4th and the 9th term of a G. P. are 8 and 256 respectively. Find the 7th term of the G. P.

[20]

Question Eight

- a) The 35th term of an A. P. is 69. Find the sum of its 69 terms.
- b) The first term of an A. P. is 10, the last term is 50. If the sum of all the terms is 480, find the common difference and the number of terms.
- c) Find the sum of the G. P.: 1, 3, 9, 27, ... up to the 10th term.
- d) Find the sum of the G. P.: $1/\sqrt{3}; 1, \sqrt{3}, \dots, 81$

[20]

END OF EXAMINATION