**SESSION MARCH 2023**

**PROGRAM MCA**

**SEMESTER I**

**COURSE CODE & NAME DCA6103, FOUNDATION OF MATHEMATICS**

**CREDITS 4**

**SET-I**

**1. State inclusion-exclusion principle. In a group of 50 people, 35 speak Hindi, 25 speak both English and Hindi and all the people speak at least one of the two languages. How many people speak only English and not Hindi? How many people speak English?**

**Solution:** The inclusion-exclusion principle states that the size of the union of two or more sets is equal to the sum of their sizes minus the size of their intersection(s).

**Let E be the set of people who** "Its Half solved only

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**2. a. Solve: ∫ 𝜋/2 0 √1 + sin 2𝑥𝑑x.**

**Solution:We can use the**

**b. Evaluate the followings:**

**(i) Lim𝑛⟶∞ 2+𝑛+𝑛^2/ 2+3𝑛+4𝑛^2**

**Solution:** To evaluate the limit, we can use the facts that as n approaches infinity, the higher order terms in the

**(ii) Lim𝑥⟶2 2𝑥^2−3𝑥−2/𝑥−2**

**Solution: To evaluate the limit, we can factor the numerator using the difference of squares:**

2𝑥^2−3𝑥−2 = (2𝑥+1)(𝑥−2)

**So the limit becomes**

**3. Solve the equations 𝑥𝑥 + 𝑦𝑦 + 𝑧𝑧 = 6 𝑥𝑥 + 2𝑦𝑦 + 3𝑧𝑧 = 14 – 𝑥𝑥 + 𝑦𝑦 – 𝑧𝑧 = – 2**

**Solution:** We can solve this system of equations by using elimination method.

**First, let's add the second and third equations to eliminate the x variable:**

(𝑥^2 + 2𝑦^2 + 3𝑧^2) + (–𝑥^2 + 𝑦^2 – 𝑧^2) = 14 – 2

**Simplifying this, we**

**4. A. By using truth tables, check whether the propositions ~(𝑝∧𝑞) and (∼𝑝) ∨ (∼𝑞) are logically equivalent or not?**

**Solution:** To check whether the propositions ~ (𝑝∧𝑞) and (∼𝑝) ∨ (∼𝑞) are logically equivalent or not, we can use

**b. Consider the set 𝐺𝐺 = {1, 5, 7, 11, 13, 17} under multiplication modulo 18 as a group. Construct the multiplication table for G and find the inverse of each element of G.**

**Solution:** To construct the multiplication table for the group 𝐺𝐺 = {1, 5, 7, 11, 13, 17} under multiplication modulo 18, we need to multiply each element of the group with every other element and reduce the result

**5. Simplify 𝒛 = (𝒄os𝜽+𝒊sin𝜽) ^5 / (𝒄os𝜽−𝒊sin𝜽)^𝟒 into 𝑥 + 𝑖y form and find its modulus and the amplitude.**

**Solution: Let's first simplify the expression:**

𝒛 = (𝒄os𝜽+𝒊sin𝜽) ^5 / (𝒄os𝜽−𝒊sin𝜽)^𝟒

𝒛 = [(cos𝜽)^5 + 5i(cos𝜽)^4sin𝜽 - 10(cos𝜽)^3(sin𝜽)^2 - 10i(cos𝜽)^2(sin𝜽)^3 + 5(cos𝜽)(sin𝜽)^4 +

**6. a. Find [dy/dx]=𝜋/2 where 𝑥 = 𝑎(𝜃 + sin 𝜃) and 𝑦 = 𝑎(1 – cos 𝜃).**

**Solution: We are given:**

𝑥 = (𝜃 + sin 𝜃) and 𝑦 = (1 – cos 𝜃).

**Differentiating**

**b. Find the divergence and curl of 𝑓= 𝑥𝑦^2^i + 2𝑥^2𝑦𝚥^ − 3𝑦𝑧^2𝑘^ at point (1, −1, 1)**

**Solution: We have the vector field 𝑓= 𝑥𝑦^2^i + 2𝑥^2𝑦𝚥^ − 3𝑦𝑧^2𝑘^, so we can start by finding its components:**

𝑓𝑥 = 𝑦^2

𝑓𝑦 = 2𝑥𝑦

𝑓𝑧 = −3𝑦𝑧^2

**To find the divergence of 𝑓, we take the dot product of the gradient operator (∇) with 𝑓:**

Div𝑓 = ∇ · 𝑓 = (∂/∂𝑥,