

1 Answer All

- a By which rule of inference the following conclusion is drawn? 1
It is raining and the frogs are flying. Hence the frogs are flying.
- b Rewrite the following argument using both universal and existential quantifier: 1
"Some men are genius."
- c What is the truth value of the statement $(p \rightarrow q) \wedge \bar{q}$ when p and q both are false? 1
- d What is the coefficient of x^{11} in $\frac{1}{1-x} + \frac{x}{1-2x}$? 1
- e Write down the form of $a_n^{(p)}$ for a recurrence relation whose characteristic roots are 2, 3, 3 with $F(n) = n + 2^n$. 1
- f What is the minimum number of persons we have to select randomly to ensure that at least two of them have the same birth month? 1

2 Answer any Three

- a Prove or disprove that there is a rational number a and an irrational number b such that a^b is irrational. 2
- b Construct the truth table for the compound proposition $p \rightarrow (\neg q \vee r)$. 2
- c Express the given statement using symbols for predicates and quantifiers; find its negation and then express the negation in English. 2
There exists a pig that can swim and catch fish.
- d Prove that there is a positive integer that equals the sum of positive integer less than it. Is your proof constructive or nonconstructive? 2
- e Show that $(p \rightarrow r) \vee (q \rightarrow r)$ and $(p \wedge q) \rightarrow r$ are logically equivalent. 2

3 Answer any Two

- a Solve the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$, $a_0 = 2$, $a_1 = 1$ 2
- b How many positive integers less than 1000000 have the sum of their digits equal to 19? 2
- c Show that among a group of 5 integers, there are two which have the same remainder when divided by 4. 2
- d Find the coefficient of x^{11} in the power series of $\frac{x}{(1-4x)^3}$ 2

4 Answer any One

- a Show that the premises: 3
"Everyone in New Jersey lives within 50 miles of the ocean."
"Someone in New Jersey has never seen the ocean"
imply the conclusion,
"Someone who lives within 50 miles of the ocean has never seen the ocean."

b Provide a formal proof for the following argument.

$$p \rightarrow q$$

$$q \rightarrow \neg r$$

$$r$$

$$p \vee (s \wedge t)$$

Therefore $s \wedge t$

3

5 Answer any Two

a Solve the given recurrence relation.

$$a_n - 10a_{n-1} + 25a_{n-2} = 2^n; a_0 = 2/3, a_1 = 3$$

3

b Use generating function to determine the number of ways 20 marbles can be chosen from an unlimited supply of indistinguishable marbles with colours red, blue and green such that there will be always an even number of green marbles.

3

c Prove that $6^{n+2} + 7^{2n+1}$ is divisible by 43 whenever n is a positive integer using mathematical induction.

3

d Use generating function to solve the recurrence relation $a_n - 9a_{n-1} + 20a_{n-2} = 0, a_0 = -3, a_1 = -10$

3