Roman Co. 1

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14 SI SI	74 P. La	Ve	* A			Date:	Sub:		LECT
Write the following argument in symbolic form and then establish the validity: If A gets the Supervisor's position and works hard, then he will get a raise. If he gets a raise, then he will buy [7]	Prove that for all integers $'k'$ and $'l'$, if k and l both odd, then $k+l$ is an even and kl is an odd by direct proof.	Verify the principle of duality for the following logical equivalent $[\sim (p \land q) \rightarrow \{\sim p \lor (\sim p \lor q)\}]$	Define tautology, contradiction, contingency. Determine whether the following compound statement is a tautology or not. $\{(p \lor q) \to r\} \leftrightarrow \{\neg r \to \neg (p \lor q)\}$		Quest	03/06/2024	Discrete Mathematical Structures	•	TECHNOLOGY
ument in synd d works hard,	s $'k'$ and $'l'$, i	uality for the $[\sim(p$	adiction, con or not. $(p \lor q)$	je S	ion 1 is compu	Duration: 90 mins	cal Structures	Inter	d.
ibolic forn then he wi	f k and l b	following $(\land q) \rightarrow \{ \land q \}$	tingency. $\rightarrow r \} \leftrightarrow \{$		lsory and £	90 mins	-	rnal Asses	
n and then esta Ill get a raise. If	oth odd, then k	r the following logical equivalen $[\sim (p \land q) \rightarrow {\sim p \lor (\sim p \lor q)}]$	tion, contingency. Determine wheth ot. $\{(p \lor q) \to r\} \leftrightarrow \{\neg r \to \neg (p \lor q)\}$		Question 1 is compulsory and Answer any 6 from	Max Marks:		Internal Assessment Test – I	
blish the	: + <i>l</i> is a	ence $] \Leftrightarrow \sim p \vee q$.	ether the	av.	om the r	50		June 2024	
e validit a raise, t	n even a	ovq.	e follow		m the remaining questions.	Sem:		024	
y: If , hen h	nd kl	· · ·	ing (ques	N	:*:	эll	
A gets the e will buy	is an odd		compound		tions.	Branch:	Code:		
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				100	1				

not work hard.

· Franker (B)

8	,7	Mi. a	No.		
For the Fibonacci numbers $F_0, F_1, F_2, \dots, prove$ that $F_n = \frac{1}{\sqrt{5}} \left[\left(\frac{1+\sqrt{5}}{2} \right)^n - \left(\frac{1-\sqrt{5}}{2} \right)^n \right].$	Prove by mathematical induction that for every positive integer n, 5 divides $n^5 - n$	Consider the following open statement on set of all real numbers as universe: $p(x): x \ge 0$; $q(x): x^2 > 0$; $r(x): x^2 - 3x - 4 = 0$; $s(x): x^2 - 3 > 0$ Then find truth value of $a) \exists x[p(x) \land q(x)] \qquad b) \forall x[p(x) \rightarrow q(x); \qquad c) \forall x[q(x) \rightarrow s(x)]$ $a) \forall x[p(x) \land q(x)] \qquad d) \forall x[r(x) \lor s(x)]$	Check the validity of following argument. If a triangle has two equal sides, then it is isosceles. If a triangle is isosceles than it has two equal angles. A certain triangle ABC does not have two equal angles The triangle ABC does not have two usual sides		
3	E	7	9		
[7] CO2 L3	[7] CO2	[7] CO1	[7] CO1		
L3	L3	L3	1.3		

Tautology: The compound proposition which has

TRUE for all possible truth value is known as

Toutology

Contradiction: is a compound proposition which has

FALSE for all its possible from value is known as

Contradiction

Contingency: is a compound proposition which has

{(b/d) → 83 ←> {-12 → C600)}

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P	QV	8	(Pvq)		1 A -> 8	A < KIN	J =	-
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.. The compound statement is totology.

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NPV9V
@>R=[N(PNQ) > [NPV(NPWQ)]=>
  LHS=[N(Pray) > ENDV(NDVa)].
    (WKT P-> 9 = NPV9)
 M= ~ ~ (N(Pray)) V (NPVCNPVY)J].
  R= (Pran) N & M PN (M PN ) 3] = N PN ON
  VONDUS CERCENANDUS V CLORAD = B
  LHS = (PV9) ~ E(MPNNP) NOV 3 (associative law).
      = (pvq) n & (n pnq) z (rdempotent law).
      = [Pr(mpnan) V [ancrevan) (queritudial)
     = [(PNNP) NOV] V [QNCNP795] (associative law).
     = (Tt va) r (av Edrub) (Eunerse &
     = (9) V (Quay) Drp) (identity & arso
         QV (drin P) (Pderupotent low)
       = (ava) NNP (associative)
            QV ~ P
                      (Pdempotent law)
             NP NO Commutative (au)
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.. principle of duality is proved.

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3>
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16+ P = K 95 odd number & LPS odd number. q = K+1 is even. private to train result (4) 8 = KC is odd. Symboly cary: P -> (q ~ 8) Direct broot: Hypothesis: - K = 2m+1 } as kel is odd number.

L = 2n+1 | (m belongs to Z & .. P is true. n also belongs to Z) Thurs in The Care of while K+L is even = (2m+1)+(2n+1) = 2mtan+2

Analysis: -0 K+L is even = (2m+1)+(2n+1) = 2m+2n+2 = 2 (m+n+1) = 2x (unere <math>x=m+n+1 & x = m+n+1 & x = m+1 & x = m+1

(a) KL = (2m+1)(2n+1) = 4mn+2m+2n+1 = 2(2mn+m+n)+1 $= 2y+1 \qquad [where <math>y = 2mn+m+n$] $= 2y+1 \qquad [y \text{ Belong to } z]$ $\therefore KL \text{ is odd}$

Concluetion: P is true

Covars is also true

P > Covars is true.

P: A ges the supervisor's position. naphrona the of H as 4 q: A works hard. r: A will get a raise S . A will bry a new car. Symbolically: (Prop) > 8) His (primists)

NS . Conduction). (24) V[S<&] V[R<-CBV2]= = [PAQ >S] A CMS) (some of symogyom) ~ (Pray) (Rure of Deny) npvng Chemorgan's (cm) = RMS. in The argument is vould. A triangle has two Equal sides. torangle is isoceles. triangle has two Equal angles a> + be the manyle. Symbolically, :-P(a) -> & ca) q(a) -> 8(a) NECOS .. NP(a)

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[P(a) \rightarrow q(a)] \land [q(a) \rightarrow r(a)] \land (n \times (a)) \Rightarrow \land P(a).
 = [P(a) -> r(a)] (Nr(a)) (Rule of syllogyem).
 = ~ [ P(a)] ( Deny)
= ~POO = RHS
                         of the server and the second
     The argument is Valid.
P(x): x >0
q(x): x2>>0
                                I was to be a second
y(x): x2-3x-4=0 ()= 1-1=1-01
S(X): X2-3>0
                      d and him think, was a -y a
a) 3x[panngam]
  for x=1
 P(J): 17/0
a, (1); 170
                  10 - 100 = A-51
 .. Trough rate is True (1)
b) +x [p(x) ->q(x)]
  of for all value of or p(x): 21,70 es vive also
  9(x): x2710 is true
         (1) SUET 21 [CX)P<-CXX] is True (1)
[cx>z<-cx>p] x 4 <>
   XX Q(X) PS true but s(X) not true for XX
      · . + [q(x) -> S(x)] is mo False (0).
```

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d> Yx [r(x) v s(x)]
 YON ES false & values of M.
   S(X) is also false of values of X.
       Ly SCXI) as only false when x = 1
   : Fase (O).
                A TABLE OF THE STREET OF STATE OF
5 divides no-n
                              3 < x : (x)
Busic step: - let n=1
            15-1 = 1-1 = 0 0 = 13-16 = 1 = (x) =
                            OKELIK : AKE
   O 95 death divisible by 5
       :. n=1 is True.
           XXX XXS/-NY7
                             1 = 30 ref
SALAHARA
                              OWN THE
Indution Star = n= K
         K5-K = 5a. → 1.
18 Substitute K = & K+1
                        Carper Gon I xx a
  ine = CK+1)5 - CK+1)
      = (5K5+10K4+10K3+5K2+5K+5)-(K+1)
                         (By binomical Expusion
     = 5(K3+QK4+QK3+K2+K+1)-(K+1)
      = (K5-K)-5(K5+2K4+2K3+K2+K+1)
5a-5b > 6 10 b
```

Contain the it serves to comply by

 $F = \frac{1}{\sqrt{5}} \left[\left(\frac{1 + \sqrt{5}}{2} \right)^{2} + \left(\frac{1 - \sqrt{5}}{2} \right)^{2} \right]$ Fn= Fn-1 + Fn-2; n>12 Fo=0, F=1

Substitute n=0

FKAZ = FKAT FKAZ-2. $(F_0 = \frac{1}{\sqrt{5}})[1-1] = (0)$ $F_{1} = \frac{1}{\sqrt{5}} \left[\left(\frac{1+\sqrt{5}}{2} \right) - \left(\frac{1-\sqrt{5}}{2} \right) \right]$.. for n=0 and n=1 the rates are True.

n=k $i.e F_k = \frac{1}{\sqrt{5}} \left[\left(\frac{1+\sqrt{5}}{2} \right)^k - \left(\frac{1-\sqrt{5}}{2} \right)^k \right] \rightarrow 0$

for In sextime (3 & 1) Instrument Ing :.

FK+1 =3 FK+ FK+19 min 12 minutes 12 minutes

$$F_{K+1} = \frac{1}{\sqrt{3}} \left[\left(\frac{1+\sqrt{5}}{2} \right)^{K^{\frac{1}{4}}} \left(\frac{1+\sqrt{5}}{2} \right)^{K} - \left(\frac{1+\sqrt{5}}{2} \right)^{K} \right] + \left(\frac{1+\sqrt{5}}{2} \right)^{K} \right].$$

$$= \frac{1}{5} \left[\left(\frac{1+15}{2} \right)^{k-1} \left\{ \frac{1+15}{2} + 1 \right\} \right) - \left(\left(\frac{1+15}{2} \right)^{k} \left\{ \frac{1-15}{2} + 1 \right\} \right)$$

$$=\frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^{k-1}\left(\frac{3+\sqrt{5}}{2}\right)\right]-\left(\left(\frac{1-\sqrt{5}}{2}\right)^{k}\left(\frac{3-\sqrt{5}}{2}\right)\right)\right]$$

$$=\frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^{\frac{1+\sqrt{5}}{2}}\left(\frac{1+\sqrt{5}}{2}\right)^{2}\right]-\left[\left(\frac{1+\sqrt{5}}{2}\right)^{\frac{1+\sqrt{5}}{2}}\right]^{2}$$

$$=\frac{1}{\sqrt{5}}\left[\left(\frac{1+\sqrt{5}}{2}\right)^{k+1}-\left(\frac{1+\sqrt{5}}{2}\right)^{k+1}\right] \rightarrow 2$$