Part A MCQ

Assignment 01

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Ques 1 (d) Set is both non empty and finite
Ques 2 (b) symmetric
Ques 3 (c) a relation that is reflexive, antisymmetric & transitive
Ques 4 (a) induction hypothesis
Ques 5 (b) $P(k) = m^k + 5$
Ques 6 (b) proper
Ques 7 (d) Partially ordered sets
Ques 8 (a) One to One
Ques 9 (a) Floor Function
Ques 10 (a) surjective

Part B Descriptive

Ques 1

$(a,b) \in R$

(a) ~~[illegible]~~

Ques 2 $f(x) = 2x$

$g(x) = x^2$

~~[illegible]~~

$fg(x) = (2x)^2$

$gof(x) = (2(x))^2$

for $x = 3$, $(2(3))^2 \Rightarrow (6)^2 = 36$

Ques 3 (a) $\{0, 3, 6, 9, 12\}$

$\{x \mid x$ is an integer and $x = 3n$ where x is an integer from 0 to 4$\}$

(b) $\{-3, -2, -1, 0, 1, 2, 3\}$

$\{x \mid x$ is an integer $-3 \leq x \leq 3\}$

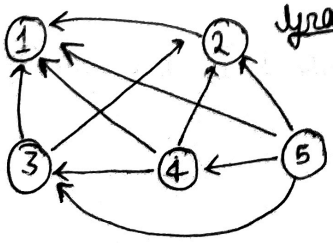
(c) $\{m, n, o, p\}$

$\{x \mid x$ is an alphabet from m to p$\}$

Ques 4 $X = \{1, 2, 3, 4, 5\}$, $R = \{(x, y) \mid x > y\}$

Pairs in $R = \{(2,1), (3,1), (4,1), (5,1), (3,2), (4,2), (5,2), (4,3), (5,3), (5,4)\}$

Graph



Matrix

	1	2	3	4	5
1	0	0	0	0	0
2	1	0	0	0	0
3	1	1	0	0	0
4	1	1	1	0	0
5	1	1	1	1	0

x → (columns)
y ↓ (rows)

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Ques 5 $1^2 + 2^2 + \dots + 2^n = 2^{(n+1)} - 1$

$n = 1$,
$2^{(1)} + 1^2 = 2^{(1+1)} - 1 = 3$

$n = 2$
$1^2 + 2^2 + 2^2 \bullet = 2^{(2+1)} - 1$

Ques 7 $P(n) = 1^2 + 2^2 + \dots + n^2 = \frac{(n(n+1)(2n+1))}{6}$

$$P(1) = 1^2 = \frac{(1)(1+1)(2+1)}{6} = 1$$

Let $P(k)$ is true

$$1^2 + 2^2 + \dots + k^2 = \frac{k(k+1)(2k+1)}{6} \quad \text{—— (1)}$$

Now $P(k+1)$

$\Rightarrow 1^2 + 2^2 + \dots + k^2 + (k+1)^2$ [from eq^n (1)]

$\Rightarrow \frac{k(k+1)(2k+1)}{6} + (k+1)^2$

$\Rightarrow \frac{(k+1)}{6}\left[k(2k+1) + 6k + 6\right] \Rightarrow \frac{k+1}{6}\left[2k^2 + 7k + 6\right]$

$\Rightarrow \frac{(k+1)}{6}\left[2k + 4k + 3k + 6\right] \Rightarrow \frac{(k+1)}{6}(k+2)(2k+3)$

$\Rightarrow \frac{1}{6}(k+1)(k+1+1)(2(k+1)+1)$

hence proved

Euclidean Algorithm

Ques 6 ① Let a and b be two numbers, $a > b$

② Divide a by b, if remainder (r) is zero, then b is gcd of a and b.

③ If r is not zero,

$a = b$
$b = r$

and repeat until r is not zero.

$a = 46,\ b = 21 \mid r = 4$

$21\overline{)46}\,|\,2$
42
4

$a = 21,\ b = 4 \mid r = 1$

$4\overline{)21}\,|\,5$
20
1

$a = 4,\ b = 1 \mid r = 0$

∴ 1 is the gcd of 46 and 21