No.: Date:

SECI1013 : DISCRETE STRUCTURE

ASSIGNMENT 2

SECPH 02

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No.: Date:

Question 1

a) Presint 4 $\xrightarrow[\text{4 walk}]{\text{3 car}}$ Presint 5 $\xrightarrow[\text{5 walk}]{\text{4 car}}$ Presint 6

$(3+4)\times(4+5) = 63$ ways

b) i) $8! = 40320$

ii) $P(8,5) = \frac{8!}{(8-5)!}$

$= 6720$ ways

iii) $1 \times 6! \times 1 = 720$ ways

c) i) $4! \times 5! = 2880$ ways

ii) $(9-1)! \times 2! = 80640$ ways

iii) $5! \times 5! = 14400$ ways

Question 2

(a)

	women	men
case 1 :	C(6,3)	C(8,2)
case 2 :	C(6,4)	C(8,1)
case 3 :	C(6,5)	C(8,0)

$({}^{6}C_3)({}^{8}C_2) + ({}^{6}C_4)({}^{8}C_1) + ({}^{6}C_5)({}^{8}C_0)$

$= 560 + 120 + 6$

$= 686$ ways

(b)

	boys	girls
case 1 :	C(10,1)	C(10,3)
case 2 :	C(10,2)	C(10,2)
case 3 :	C(10,3)	C(10,1)
case 4 :	C(10,4)	C(10,0)

$({}^{10}C_1)({}^{10}C_3) + ({}^{10}C_2)({}^{10}C_2) + ({}^{10}C_3)({}^{10}C_1) + ({}^{10}C_4)({}^{10}C_0)$

$= 1200 + 2025 + 1200 + 210$

$= 4635$

No.: Date:

Question 3

(a) (i) $(n-1)! = (5-1)!$

$= 4!$

$= 24$ ways

(ii) $\underline{CV_1V_2}\ \underline{P}\ \underline{P}$

$3!\ (3-1)!$

$= 12$

(b) Total $= 5!$

$= 120$ ways

If head and assistant next to each other

$\underline{HA}\ \underline{P}\ \underline{P}\ \underline{P}$

$2! \cdot 4!$

$= 48$ ways

Total of ways if head and assistant cannot sit next to each other

$= 120 - 40$

$= 72$ ways

(c) (i) $C(10+6-1, 6) = \dfrac{(10+6-1)!}{6!\ (10-1)!}$

$= 5005$ ways

(ii)

	Hazelnut (1 flavour)	Others (10 - 1 = 9 flavours)	
case 1 :	C(4,4)	C(10,2)	= 45
case 2 :	C(5,5)	C(9,1)	= 9
case 3 :	C(6,6)	C(8,0)	= 1

Total $= 45 + 9 + 1 = 55$ ways

(iii) $C(10,6) = 210$ ways

No.: Date:

(d) (i) $C(13,11) = 78$ ways

(ii) $P(13,11) = 3113510400$ ways

(iii)

	woman	men	
case 1 :	$C(3,1)$	$C(10,10)$	$= 3$
case 2 :	$C(3,2)$	$C(10,9)$	$= 30$
case 3 :	$C(3,3)$	$C(10,8)$	$= 45$

Total $= 3 + 30 + 45$

$= 78$ ways

Question 4

a) 3 balls: red, yellow green (Pigeonholes)
Number of balls taken (Pigeons)

Based on the pigeonhole principle, number of pigeons must be more than the number of pigeonholes so that at least 2 pigeons are in the same pigeonholes. Therefore, number of balls taken must be at least 4 to get two balls of the same colour.

b) Pigeons, $n = 80$ (Number of cheesecake pieces)
Pigeonholes, $m = 32$ (Number of students and teachers)

$$k = \frac{n}{m}$$

$$= \frac{80}{32}$$

$$= 3$$

So, each student and teacher will have at least three pieces of cheesecakes.

(c) $\{2,3,4,6,7,8\}$: smallest number of integers must be chosen at least 1 pair has sum of 10

$2+8=10$ sum of 10 $= \{(2,8),(3,7),(4,6)\}$

$3+7=10$ $n=6,\ k=3$

$4+6=$ $k<n$

$3<6$

$\therefore$ True, at least 4 integers so that any set can have at least 1 pair of sum of 10

(d) At least 1 grade has 6 students

$5\times5=25$ students, each grade has 5 students

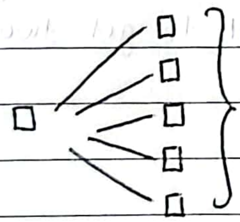
if 26 students, $m=\left\lceil\frac{26}{5}\right\rceil$ if 27 students, $m=\left\lceil\frac{27}{5}\right\rceil$

$=5.1$ $=5.4$

$=6$ $=6$

$\therefore$ Minimum number of students $=26$ students

(e)



can connect to 0 or 5

if connect to 0, then it cannot connect to other computers

$m=\left\lceil\frac{6}{5}\right\rceil = 1.2 = 2$ computers

$\therefore$ There should be at least 2 computers can connect to 1 computers