Assignment 3

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BCS-4F

VP PF
↑ ↑
(0,8), (1,3), (2,11), (3,1)

Q1- Virtual Address = 6 bit
page/frame = 16 byte

p1 d1 → f3 d1
=

(a) Addresses = ~~$2^6 * 64$~~ $2^6 - 1 = 63$ addresses

displacement bits → 16 bytes $= 2^4$ $= 7$ 4 bits
=

- Binary of $(17)_{10}$ = 010001
- Page Number = 17 % 16 = 1
- PF = 3 → PF base = 3 × 16 = 48

Physical Address = 48 + 1 = 49

$(49)_{10} = (110001)_2$

(b) $(35)_{10} = (100011)_2$

p2 d3 → f11 d3
=

35 / 16 = 2

- Page Number = 35 % 16 = 3 ⇒ offset = 3 (Mapping (2,11) used)
=
- PF = 11 → PF base = 11 × 16 = 176
- Physical Address = 176 + 3 = 179

$(179)_{10} = (10110011)_2$

Q2- L.P, P.P= 4 kB , Page Entry= 4 byte

(a) $4kB = 2^{12}$ → offset = 12

Page Entry → 4 kB / 4 B = 1024 = 2^{10} entries

max pages = 64 - 12 = ~~42~~ 52 ⇒ 2^{52} pages

$\lceil 52 / 10 \rceil$ = 6 Levels | 52 = 10+10+10+10+10+2

(b) p|d = 2 10 10 10 10 10 | 12

Q3- 4 Logical Pages

V.A = 16 = 2^4 ~~= 4~~ (0,11), (1,35), (2,3), (3,1)$_I$

Page size = 256 bytes = 2^8 ~~= 8~~ offset = 8 bits

VPN = 16 - 8 = 8 bits 2^8 = 256 pages

(a) $(772)_{10} = (0000001100000100)_2$

772/256 772%256

- Page = 3 , offset = 4
- Frame = 1 → PF base = 1×256 = 256
- Physical Address = 260

$(260)_{10} = (00000001\ 00000100)_2$

f d

Binary

11 = 00001011

35 = 00100011

3 = 00000011

1 = 00000001

p | d

~~0000~~

(b) $(456)_{10} = 0000000111011000$

456/256 456%256

- Page = 1 , offset = 200
- Frame = 35 → PF base = 35 × 256 = 8960
- Physical Address = 8960 + 200 = 9160

$(9160)_{10} = (0010\ 0011\ 1100\ 1000)_2$

PI d200 => f35 d200

Q4- Logical Address = 20 bits

Memory size = 256 k bits = 32 kB = 2^{15}

★ Assumption of 256 k bits, not 256 k bytes

page bits = 8

displace bits / offset = 12

(a) Page size = 2^{12} = 4096 bytes = 32768 bits

(b) Max Pages = 2^8 = 256 pages

(c) (256 × 1024) ÷ (32768) = 8 frames

(d) 5 bits in total

2 + 3
2 + 3
2 + 3
2 + 3
⋮

// 2 for attribute
3 for frame/page

e) 5 bits

f) 1024 k bits = 128 kB = 2^{17}

frame bits = 5

2^5 = 32 frames

5 + 2 = 7 bits

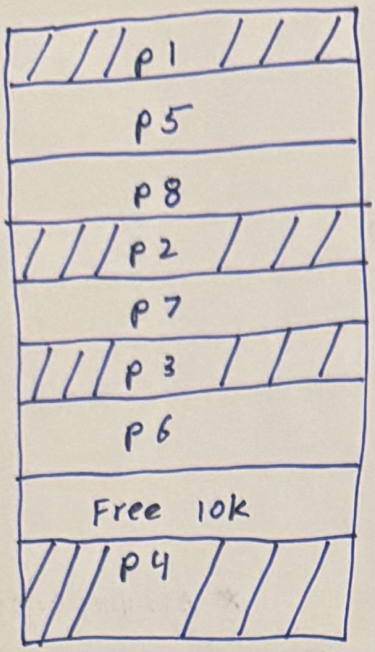
5 → frame
2 → attribute

Q5–

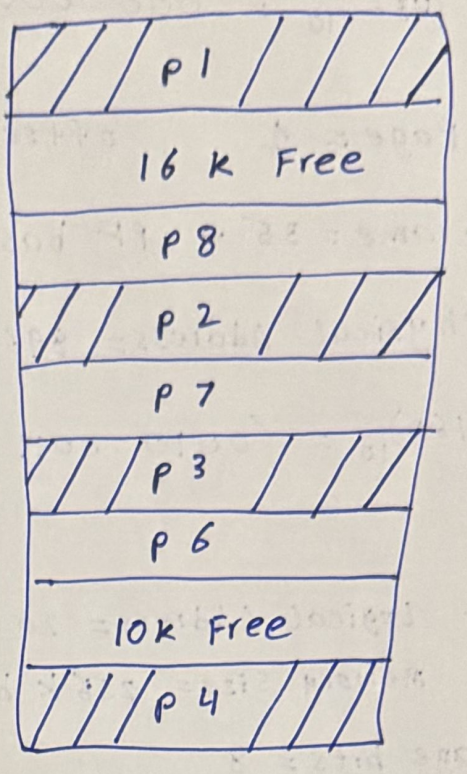
(a)

FIRST FIT

(iv)

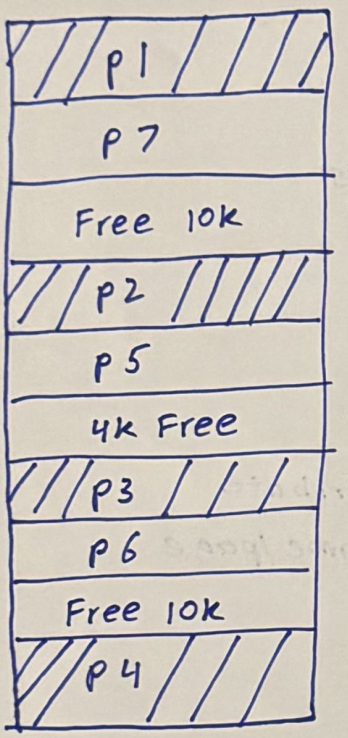


(vi)

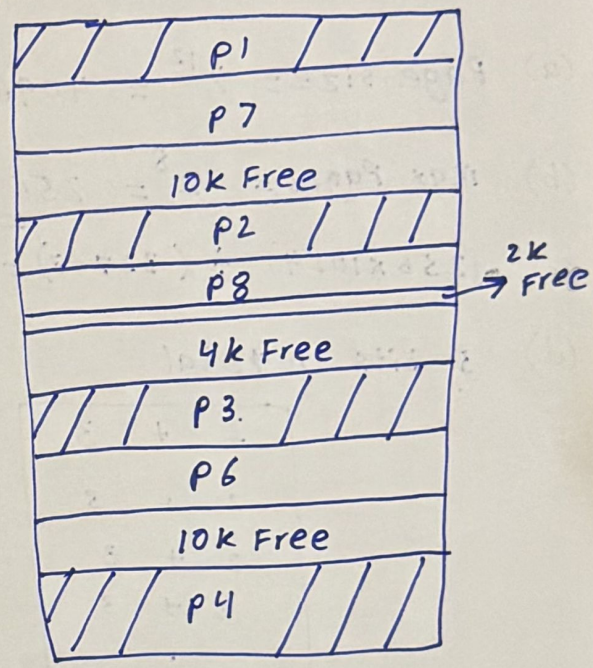


BEST ~~WORST~~ FIT

(iv)

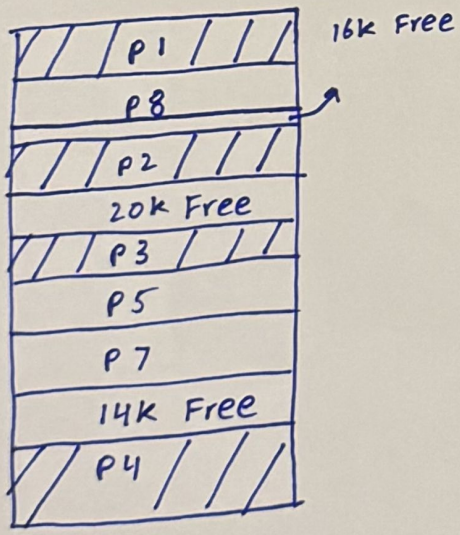


(vi)

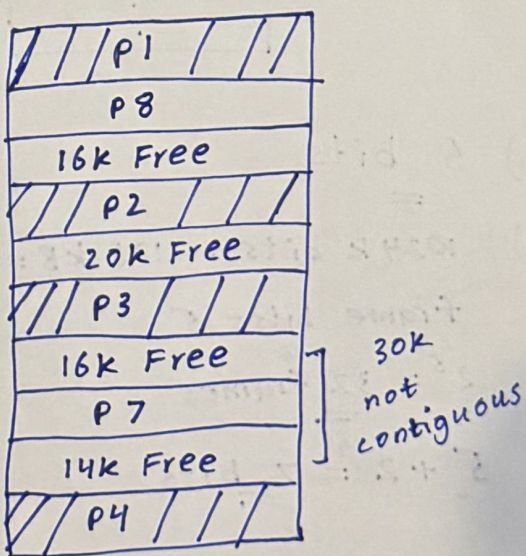


WORST FIT

(iv)



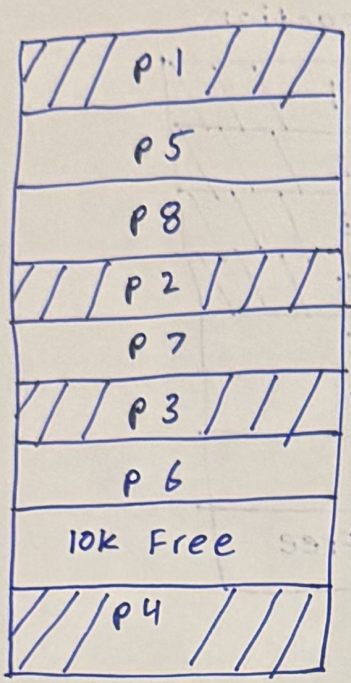
(vi)



(b) Assuming that best-fit and worst-fit not required ~~b/c~~ ~~of~~ during compaction, so only 2 maps assumed for answer (1 for (iv), 1 for (vi))

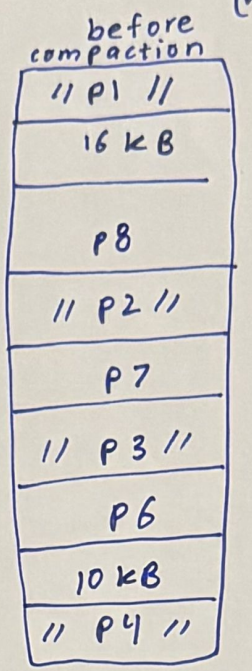
(iv)

FIRST FIT

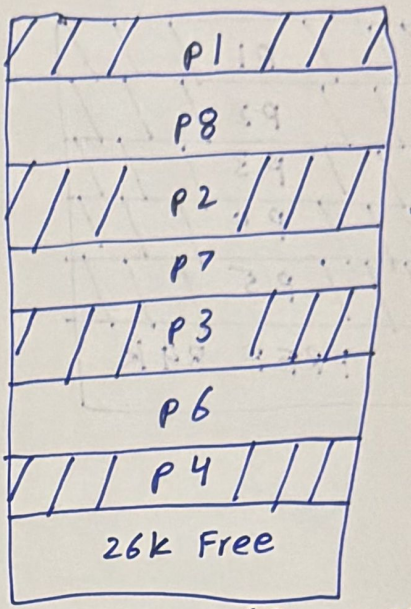


(vi)

before compaction



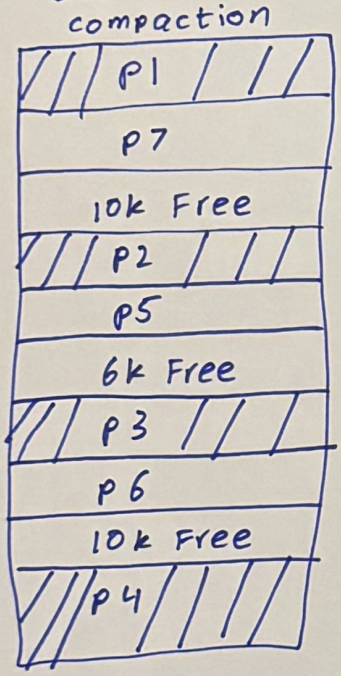
After compaction



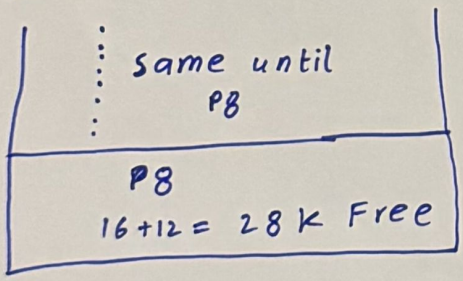
→ can't insert P9, no space

BEST FIT

Before compaction

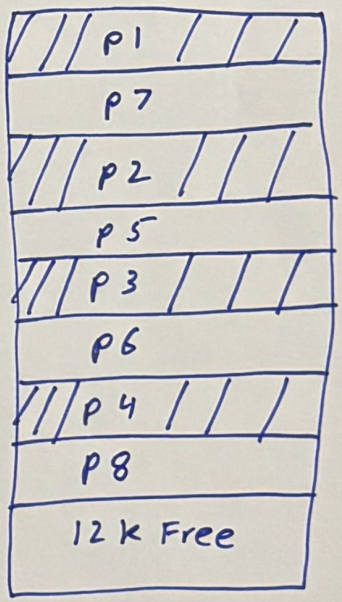


↗ P5 EXISTS, 2nd compaction



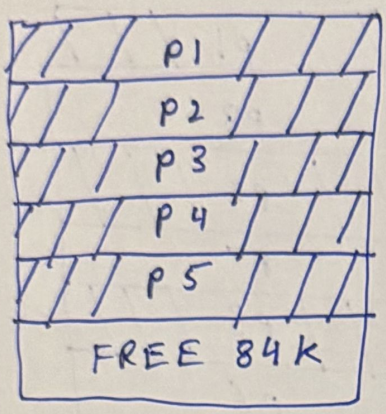
←

After compaction + insertion of P8 in released area



WORST FIT

After compaction + inserting P5



~~co~~ P5 leares ~~levels~~ + compaction