Exercise 1

1. 3019 for Berlin tram routes Es: we have colours 1, 2, 3, 4, 5, 6, 7, (say) allotted to route Lolour M1, M2,16, 18, 37, 61 1 M4, MIT, 50,62 2 M5 , 12 , 21, 63 3 CY16, 60, 4 9/8, 27, 68 5 6 M10, 67 7 M13 So, minimum colours required for colouring the nep Heron 7. are

Procedure:

From the given sheet we can clearly see that

a group of routes that intersect water each other

So they need to be allotted different colours

such group of routes are M2, M4, M5, M6, M8, M10

So colours soutes

1 M2

2 M7

3 M5

4 M1

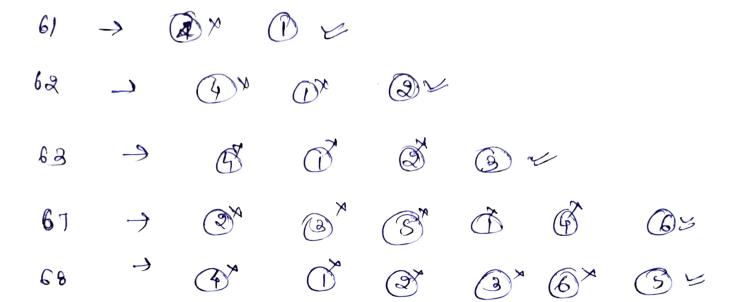
5 M6

6 M10

Mow well see for noute only as only intersect with one, Ms, M10 so we can't assign colour so, 5, 6 to only now let as say we have given colour I to only

orloving on to nowte 12 as rowte 12 (ntersect with only 12, one, M8, M10 so we can't assign abouts 1,2, 5,6 to extreme 12, let us say we have assigned colour 3 to sowte 12

Moving on to soute M13 we see that soute M13 intersect with MI, CM2, CM2, CMB, CMB, CM10 so wear can't assign colour 1/2,3,4,5,6 to evils therefore we will assign a new colour to MB ley of Isay) Repeating the above procedure we will see that originum no of colours used are 4 Below is the rough idea of what I have written above : M2 -> 1 M4 -> 2 M5 -33 M6 -> 1 M8 -> 5 0410->6 $\mathcal{O}(1) \rightarrow \mathcal{O}(1) \rightarrow \mathcal{O}$ M13 -> (7) y 16 → BY BY BY $\mathcal{O} \longrightarrow \mathcal{O} \longrightarrow$ → (B) (D) × 18 -> (8)* (6)* (1)* (1)* (3)~ 21 -) @ r @ r @ r @ r @ r @ r & co r & c 27 37 50 \rightarrow \bigcirc 37 B7 O7 6 = 60 → (g) ×



Exercise 2: Bin Pading: we are given etems (1,2,... or) with weights (01, 102,103,1... W) Bin Capality is B Arst, orrange the weights of items of order con, won-1,...wi (say) allocate them ento different bins with capacity B say for un, allot won in bin bi (say) now to allot ugo -1 check wortwen-1) & B of this holds them allocate uny in bin B1 otherwise create new bin b2 and allocate won in Bin B2 . Now for weight win-2) Lwn-1 con check whether it can be allocated in bin be following the of condition continue B or can be allocated in big by and of not then create new bin by for allocation

Repeat above procedure for other weights of etems,

3

let weights of items be 5,4,3,3,3 &,3,2,3 and bin copacity be 10
Applying FFD algorithm arrange weights in decreasing order 5-433333332 Bin 1 5 4 Bin 2 3 3 3 Bin 3 3 2 2 Bin 4 2. above arrangement me can clearly see we get better optimal solution than that we got from FED algorithm 5 3 2 Bin - 1 4 3 9 13in - 2 3 2 2 Bin -3

Clearly, we can see in our modified procedure of bin packing we have used only three bins and with non accuracy as in 1st procedure BM 1,3 1 space left 2 Bin 4 8 span left.

Given i we have on routes and there is a route that Portracits the other ord routes, we have asked whether we need on colours to be present map. True or false Talse.

Counterexample:

3

we have 5 or utes (say)

(M)1, (X12, (X)3, (X)4, (X)5

and (M)1 intersects with all other routes

but as per our scenario (Ma 2 (M)4 doesnot intersect (say)

intersect (say) and (M3 2 M5 doesnot intersect (say)

then we can assign colours in such a way

alours noutes

(M)

MA (M)

MA (M)

colours used are 3. whereas routes are 57,

M 3 M5