

**CSE 318**  
**OFFLINE -3**  
**On**  
**Local Search Problems**

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## Collected Data

### Largest Degree (Exponential Penalty)

Input Data	Known Best Solution		Scheme-1 Largest Degree + Kempe + PairSwap			
	Time Slot	Penalty	Time Slot	Penalty		
				After Largest Degree	After Kempe	After PairSwap
<b>car-f-92</b>	32	3.74	32	10.614	5.105	4.920
<b>car-s-91</b>	35	4.42	35	11.557	6.311	6.052
<b>kfu-s-93</b>	20	12.96	20	46.493	16.814	14.769
<b>tre-s-92</b>	23	7.75	23	15.894	9.852	9.522
<b>yor-f-83</b>	21	34.84	23	63.895	34.381	33.944

### Saturation Degree (Exponential Penalty)

Input Data	Known Best Solution		Scheme-2 Saturation Degree + Kempe + PairSwap			
	Time Slot	Penalty	Time Slot	Penalty		
				After Saturation Degree	After Kempe	After PairSwap
<b>car-f-92</b>	32	3.74	30	9.955	5.811	5.624
<b>car-s-91</b>	35	4.42	31	12.701	7.398	7.206
<b>kfu-s-93</b>	20	12.96	19	46.747	17.558	16.290
<b>tre-s-92</b>	23	7.75	23	15.650	9.740	9.441
<b>yor-f-83</b>	21	34.84	20	61.658	47.351	45.769

### Largest Enrollment (Exponential Penalty)

Input Data	Known Best Solution		Scheme-3 Largest Enrollment + Kempe + PairSwap			
	Time Slot	Penalty	Time Slot	Penalty		
				After Largest Enrollment	After Kempe	After PairSwap
<b>car-f-92</b>	32	3.74	34	10.962	4.783	4.628
<b>car-s-91</b>	35	4.42	36	13.772	6.002	5.722
<b>kfu-s-93</b>	20	12.96	21	54.561	14.957	13.765
<b>tre-s-92</b>	23	7.75	22	16.330	10.357	9.94
<b>yor-f-83</b>	21	34.84	24	63.983	34.577	33.349

### Random Ordering (Exponential Penalty)

Input Data	Known Best Solution		Scheme-4 Random Ordering + Kempe + PairSwap			
	Time Slot	Penalty	Time Slot	Penalty		
				After Random Ordering	After Kempe	After PairSwap
<b>car-f-92</b>	32	3.74	46	7.541	2.886	2.620
<b>car-s-91</b>	35	4.42	48	9.530	4.035	3.784
<b>kfu-s-93</b>	20	12.96	26	37.617	9.585	8.494
<b>tre-s-92</b>	23	7.75	29	12.750	6.655	6.185
<b>yor-f-83</b>	21	34.84	27	50.396	27.796	26.814

### Saturation Degree (Linear Penalty)

Input Data	Known Best Solution		Scheme-5 Saturation Degree + Kempe + PairSwap			
	Time Slot	Penalty	Time Slot	Penalty		
				After Saturation Degree	After Kempe	After PairSwap
<b>car-f-92</b>	32	3.74	30	6.481	3.843	3.676
<b>car-s-91</b>	35	4.42	31	8.115	4.875	4.742
<b>kfu-s-93</b>	20	12.96	19	29.004	12.201	11.123
<b>tre-s-92</b>	23	7.75	23	10.048	6.414	6.198
<b>yor-f-83</b>	21	34.84	20	38.925	29.507	29.343

## Conclusion

From the collected data, We can deduce that the saturation degree works well in terms of time slot. It mostly finds a solution which has a lower time slot than the best known solution. But it has a higher amount of exponential penalty. On the other hand, random ordering generates an excellent penalty but it takes a lot more slots. Hence, as minimizing time slots is our primary goal, we prefer Saturation Degrees as our Constructive Heuristics. Moreover, Kempechain Interchange improves our penalty a lot compared to PairSwap which works after Kempechain Interchange. Here, we tried to run both perturbative heuristics around 20,000 times.