

Cairo University

Institute of Statistical Studies & Research

Operations Research Master Introductory

Year: 2009/2010, 1st Term

Scheduling Exam O.R.612

Examiner: Dr. Amin Abdel-shafy

Answer the following questions:

Question one

- Explain in detail the input and output information to the scheduling problem?
- A single-machine facility faces the problem of sequencing the production work for the six customer orders described in the following table below.

Order	1	2	3	4	5	6
Processing time (hours)	20	27	16	6	15	24

- What production sequence will minimize the mean flow time of these orders, assuming all six arrived at the same time? What is the mean flow time in this schedule?
- Suppose that customer orders 2 and 6 are considered three times as important as the rest. What production sequence would you propose?

Question two

- What are the functions of performance measures to the schedules evaluation?
- A computer systems consulting company is under contract to carry out seven projects, all with deadlines, measured in days from now. The consultants are a small group and must work together on each project, so that the projects will be started and completed sequentially. Under the terms of contract, the consultants will receive \$800 for each project completed on time, but they will incur \$500 in penalties for each project completed late. Each project has an associated duration, which is the anticipated number of days required to carry the project out, as shown below. How should the projects be sequenced in order to maximize net revenues?

Project ID	1	2	3	4	5	6	7
Duration	2	4	6	8	10	12	14
Deadline	6	12	30	19	12	18	24

Question three

- Each machine scheduling problem is assigned by a symbol $(\alpha / \beta / \gamma)$ suggested by Graham et al.

Explain? What is the meaning of these symbols:

$$(J_2 / \text{dynamic} / C_{\max}), (F_3 / \text{static}, d_j \text{spec.}, / N_T), (O_m / \text{static}, \bar{p}_j / \bar{F})$$

b) A manufacturer of bracelets has five jobs to schedule for a leading customer. Each job requires a stamping operation followed by a finishing operation, which can begin on an item immediately after its stamping is complete. The table below shows operation times per item (in minutes) for each job in the order. In addition, preparations for each job at the stamping facility require a setup before stamping processing begins, as described in the table. Find a schedule that completes all five jobs as soon as possible and analyze it.

Job	Items in Lot	Stamping	Finishing	Setup Time
1	20	2	8	100
2	25	2	5	250
3	100	1	2	60
4	50	4	2.5	60
5	40	3	6	80

Question four

- a) Develop an integer programming formulation of the flow shop problem given that:
 no. of jobs = n, no. of machines = m.
- b) Find the sequence for the problem ($J_2 / static / C_{max}$), as shown in the table below.

Job	1	2	3	4	5	6	7	8
Sequence	1	1	1	1	2	2	2	2
of Machines	2	-	-	2	1	-	1	-
Processing	4	3	4	5	1	1	7	3
Times	6	-	-	2	2	-	8	-

Question five

- a) What is the classification of schedules for job shop scheduling problem, and give the definition of each?
- c) Generate all active schedules for the following problem.

		O	1	2
J				
1			1	3
2			2	1

Processing Times

		O	1	2
J				
1			1	2
2			2	1

Routing

~~Finished~~
 With my Best Wishes