Answering ideas for the TEK 421 exam in Jan 2017

Problem 1 (22 points)

1.1p per correct answer.

1.1 a	1.2 d	1.3 c	1.4 c	1.5 d
1.6 c	1.7 c	1.8 c	1.9 c	1.10 a
1.11 a	1.12 d	1.13 d	1.14 d	1.15 b
1.16 a	1.17 c	1.18 d	1.19 d	1.20 c

Problem 2 (9 points)

- Operational planning and strategic planning, and aligning these
- Supply and demand balancing
- Capacity: resource requirement, available capacity
- Cross-functionality
- Interorganizational coordination

Essential coordination mechanisms lacking in answers (if one or more of these were lacking, not full points were given):

- S&OP is a formal process with strict timetables that as such engages people, functions, and functional plans into the same planning procedure, and enhances commitment to the plan (one-set-of-numbers)
- Inter-organisational integration
- Balancing demand and supply
- Cross-functional coordination
- Tactical planning, incorporated to strategic planning, and gives guidelines to operational planning

Problem 3 (9 points)

The answer should express understanding on the uncertainties connected to (and how they increase complexity):

- The product and production: no of product variants, BOM structure, perishability, life-cycle, production network complexity
- Market-related factors, Demand, predictability, special demand situations (product intros, seasons, promotions), no of customers and differences between customers and customer groups, rate of change in the product portfolio
- Supply: supply uncertainty, availability, quality, no of suppliers and contacts.

Problem 4 (9 points)

Described during material planning lecture November 14th and textbook chapters of that lecture. MRP logic: 1. DRP can link requirements between stock points (through the bill of distribution), 2. Time-phased order point, i.e. lead time offsetting and delivery schedule generation.

Run-out time: Priority numbers and fair-share allocation. Could be allowed when global shortage.

Periodic ordering: Multi-echelon inventory control: The reorder interval at any stage is an integer multiple of a base reorder interval. Customers with longer reorder interval than the supplier, make the customer's reorder interval an integer multiple of the supplier's interval. This results in coordinated ordering in supply chain. Could be applied when stable demand and large cycle stocks.

Problem 5 (9 points)

In the course textbook Manufacturing Planning and Control, clear descriptions are provided of what the method entails (p. 354-355), what the benefits and drawbacks are (p. 355-356.) and in what types of production environment the method is best applied (p. 356).

Problem 6 (6 points)

Both one-card kanban systems and two-card kanban systems are described in the course textbook Manufacturing Planning and Control (p. 326-335) and were also described during the lecture November 18th. To be awarded full points, the exam answer should display the following:

- The answer should show that the student has an understanding of the basic principle of a kanban system, being a replenishment method.
- The distinction between *move kanban cards* and *production kanban cards* should be clear from the answer and should be connected to the distinction between one-card and two-card kanban systems.
- For both one-card and two-card kanban systems, the answer should include an account of how the kanban cards move through a full cycle of signaling and replenishment – i.e. both how the cards are moved and used for signaling a need for replenishment, and how the cards move back to the points of consumption.
- The answer should show that the student has an understanding of the function that buffers have within a kanban system (both one-card and two-card kanban systems).
- For the two-card kanban system, the answer should show that the student has an understanding of how production is initiated based on the production kanban cards, considering e.g. queues of cards and batch sizes.

Problem 7 (16 points)

a) 22 + 0.3 + 0.4 + 0.5 + 0.8 = 24 full time workers.
24 workers x 15 products/week x 52 weeks/year / 4 quarters = 4680 units/quarter.

Quarter	1	2	3	4	Total	Cost
Forecast	6 500	2 500	1 000	7 500	17 500	
Production	4 680	2 500	1 000	4 680	12 860	12 860 x 200 = 2 572 000
Overtime	320			2 820	3 140	3140 x 300 = 942 000
Inventory (1 500)	0	0	0	0		
Av. inventory	750	0	0	0	750	750 x 50 x 13 = 487 500
Backorder	0	0	0	0	0	0
Total						**4 001 500**

No, they should not change.

b) Both items C and E are produced in WC300.
8 C and 4 E are needed for every A.

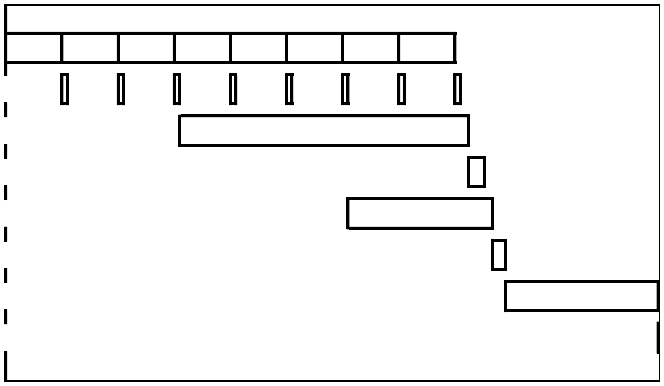
Set-up time for C: 30 min / 15 pieces = 2 min/piece.
Run time for C: 5 min.
Total time for C: 7 min/piece.

Set-up time for E: 60 min / 60 pieces = 1 min/piece.
Run time for E: 15 min.
Total time for E: 16 min/piece.

Capacity requirements for one A: 7 x 8 + 16 x 4 = 56 + 64 = 120 min = 2 h.

c) One batch of A (15 units) requires:
- B: 15 x 1 = 15 units = 1 batch.
- C: 15 x 8 = 120 units = 8 batches.
- D: 15 x 3 = 45 units = 1 batch.
- E: 15 x 4 = 60 units = 1 batch – already available.
- F: 15 x 6 = 90 units = 1 batch – already available.

Produce C: (30 + 15 x 5) x 8 = 840 min
Transport C: 10 min
Produce D: 90 + 45 x 10 = 540 min
Transport D: 30 min
Produce B: 120 + 15 x 10 = 270 min
Transport B: 25 min
Produce A: 60 + 15 x 15 = 285 min
Transport A: 5 min



Total throughput time: 6PC + TC + PB + TB + PA + TA =
6 x 840 / 8 + 10 + 270 + 25 + 285 + 5 = 1225 min = 20.4 h = 2.55 days.