

107 學年度第一學期博士學位候選人資格考試

考試科目：鋼鐵材料與結構

考試方式: Closed Book考試時間: 100 分鐘

1. Please answer the following questions about the iron-carbon phase diagram.
 - (i) Please sketch the Fe-C phase diagram, and briefly discuss it (10%).
 - (ii) Identify the eutectic and eutectoid points on the phase diagram, and discuss their corresponding microstructures and their effects on mechanical properties (15%).
2. Please answer the following questions about strengthening mechanisms in steel.
 - (i) What is the underlying mechanism that gives rise to strain-hardening effects in steel? (5%)
 - (ii) Why does smaller grain size increase the strength of steel? (5%)
 - (iii) Why do heavily alloyed steels have higher strength than other steels in general? (5%)
 - (iv) Why do high strength steels have low ductility in general? (5%)
 - (v) How does the martensitic transformation change the strength of steels? (5%)
3. Please derive the theoretical effective length factors (K) for Column I and Column II as shown in Figure 1. (34%)

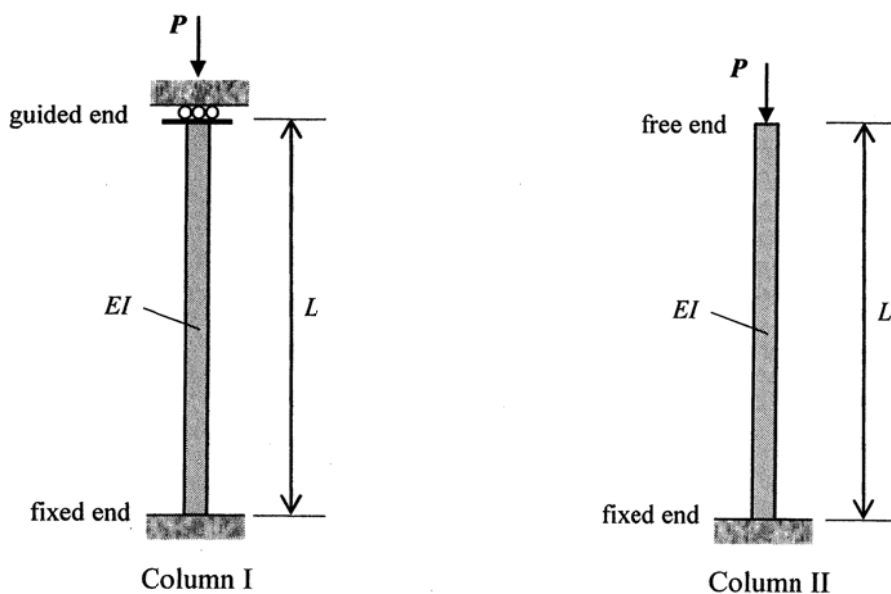


Figure 1

4. Please compute the maximum load factor P of the fixed-base portal frame as shown in Figure 2. Note that the two columns and beam of the portal frame have the same plastic moment M_p . Show your answer (i.e. the maximum load factor P) as the function of M_p and L . (16%)

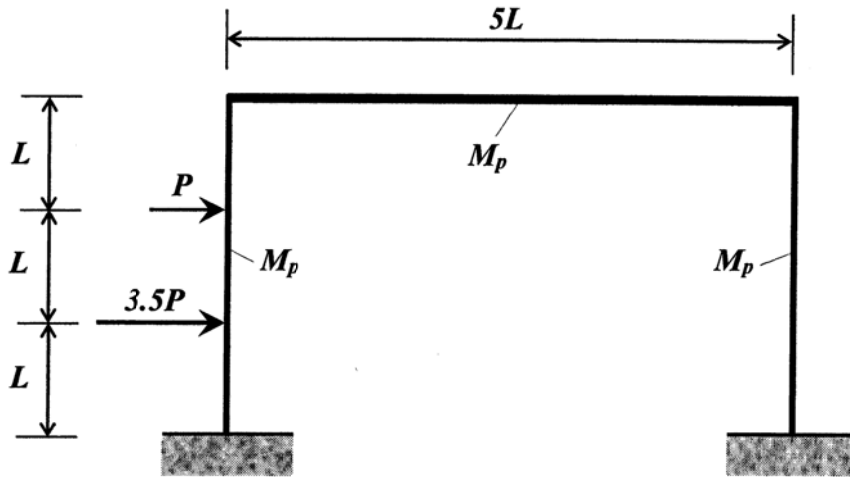


Figure 2

Qualification

1. Answer the following questions (20%)
 - 1.1. What is an example of a procurement activity that might be a valuable inclusion in a network?
 - 1.2. Conversely, what is an example of a procurement activity that has little merit for inclusion in a network?
 - 1.3. If "order tiles" requires a lead time of 35 days and "install tiles" can start right after "get surface ready for tiling" is finished, will you define the relationship between "order tiles" and "install tiles" as FS/35 ? Why? if not, what relationship would you define?

2. Finish the following questions according the information listed in Table 1.
 - 2.1. Develop a Precedence Diagram (Activity on Node). (5%)
 - 2.2. Determine the ES, EF, LS, LF, TF, FF and full them in the Table 1. (10%)
 - 2.3. Identify the critical path (5%)
 - 2.4. Develop an Arrow Activity (Activity on Arrow) and explain what type of dummies if there are any. (10%)

Table 1

Activity ID	Duration	Predecessors	ES	EF	LS	LF	TF	FF
1	6	--						
2	9	1						
3	5	1						
4	5	1						
5	8	2						
6	7	2						
7	4	5						
8	15	4, 6						
9	5	7						
10	6	4, 5, 6						
11	12	3, 7						
12	12	8, 10						
13	4	9, 11, 12						

* Use beginning of day convention. All activity relationships are (FS,0)

3. The task of forming beams and slabs of one floor requires 20 days with a standard deviation of 2 days.(25%)
 - 3.1. What duration should be used if there is to be a 90% confidence that the duration would not be exceeded?
 - 3.2. What is the probability that the duration will be less than 15 days?
 - 3.3. What is the probability that the duration will be longer than 22 days?

4. A construction progress is shown as in Figure 1 and Table 2.

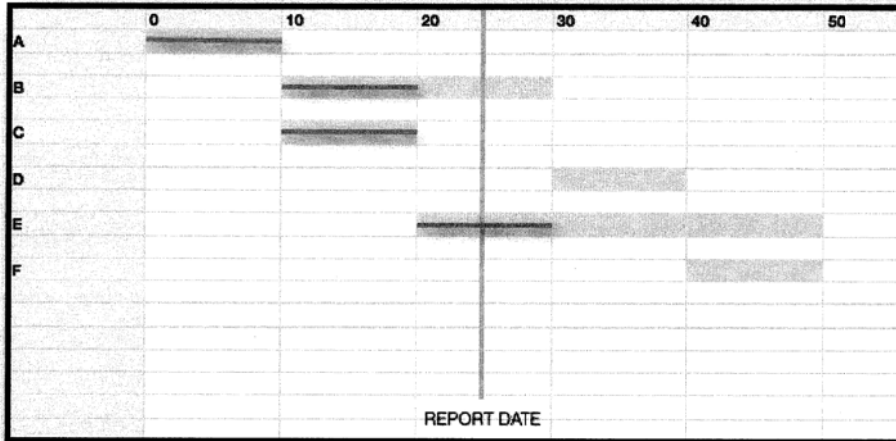


Figure 1

Table 2

Activity	Cost	Schedule d %	Actual I %	BCWS	BCWP	ACWP	SPI	CPI	Budget ? Schedule ?
A	1000	?	?	?	?	900	?	?	?
B	2100	?	?	?	?	1100	?	?	?
C	3000	?	?	?	?	3100	?	?	?
D	3600	---	---	---	---	---			
E	2000	?	?	?	?	750	?	?	?
F	8000	---	---	---	---	---			
Total	19700			?	?	?			
Project	SPI	?							
Project	CPI	?							
Cost at Completion		?							

- 4.1. Please fill out the Table 2 to show the project status information of the activities and the construction project. (10%)
- 4.2. Explain how this construction performs (5%)
- 4.3. Estimate the cost at completion of this construction project. (10%)

Qualification

1. A construction company is considering to develop an information system for managing its projects. After a through interview, you conclude that a business process reengineering (BRR) should be conducted. What should you look for when trying to identify business process to change? why? (25%)
2. What are the differences between Structured Query Language and Query By Example? (10%)
3. Please identify and explain the rule violations and formating errors within the DFD shown in Figure 1. (25%)

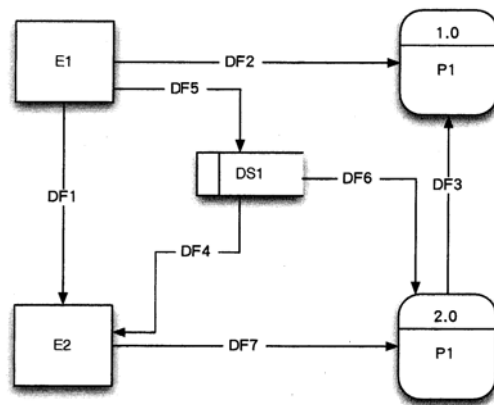


Figure 1

4. Use the following business rules to answer the questions:
 - a. A department employs many employees, but each employee is employed by one department.
 - b. Some employees, know as "Rover," are not assigned to any department.
 - c. A division operates many departments, but each department is operated by one division.
 - d. An employee may be assigned to many projects and a project may have many employees assigned to it.
 - e. A project must have at least one employee assigned to it.
 - f. One of the employees manages each department.
 - g. One of the employees runs each division.
- 4.1. Develop an appreciate E-R diagram (20%)
- 4.2. Write all the cardinalities into the model.(10%)
- 4.3. Modify the E-R model by splitting the M:N relationship into two 1:M relationships that are connected through a composite entity. Then rewrite the connectivities and cardinalities to match the changes you have made.(10%)

Note: You need to add necessary attributes to keep track of how many components go into making products and components.