Ministry of higher education
Higher institute for engineering
and Technology
New Damietta
Course title: Engineering management
No. of pages ٦

Summer Semester (July ٢٠١٨)
Midterm exam
Level ٣ **Communications & Electronics**
Time allowed: ٩٠ min
Full Mark: ٢٠ Marks

Model Answer

Question No. ١ **[٥ marks]**

Write in details the factor affecting project management?

١) **Scope :** Scope looks at the outcome of the project undertaken. This consists of a list of deliverables, which need to be addressed by the project team. A successful project manager will know to manage both the scope of the project and any change in scope which impacts time and cost.

٢) **Time:** A project's activities can either take shorter or longer amount of time to complete. Completion of tasks depends on a number of factors such as the number of people working on the project, experience, skills, etc. Time is a crucial factor which is uncontrollable. On the other hand, failure to meet the deadlines in a project can create adverse effects. Most often, the main reason for organizations to fail in terms of time is due to lack of resources.

٣) **Process :** A process is a series of actions bringing abot result while a result is a "concrete outcome".

٤) **People**: management people is the single most challenging part of managing projects , if not managing life in general

٥) **Cost**: It's imperative for both the project manager and the organization to have an estimated cost when undertaking a project. Budgets will ensure that project is developed or implemented below a certain cost. Sometimes, project managers have to allocate additional resources in order to meet the deadlines with a penalty of additional project costs.

٦) **risk**: If a potential risk of the project is not identified early, than the project will be at high risk to complete as per schedule. Risk identification determines which risks might affect the project and documents their characteristics. however we should not spend too much time in identifying risks.

٧) **quality**

Quality is not a part of the project management triangle, but it is the ultimate objective of every delivery. Hence, the project management triangle represents implies quality.Many project managers are under the notion that 'high quality comes with high cost', which to some extent is true. By using low quality resources to accomplish project deadlines does not ensure success of the overall project. Like with the scope, quality will also be an important deliverable for the project.

٨) **communications**

Is an essential tools putting processes in place , its not only speaking and hearing from people , its about understanding the complete message

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Question No. ٢ **[٧ marks]**

Oil Company manufactures three types of gasoline. Each type is produced by blending three types of crude oil. The sales price per barrel of gasoline and the purchase price per barrel of crude oil are given in Table ١. The company can purchase up to ٥,٠٠٠ barrels of each type of crude oil daily.The three types of gasoline differ in their octane rating and sulfur content. The crude oil blended to form gasoline١ must have an average octane rating of at least ١٠ and contain at most١ %sulfur. The crude oil blended to form gasoline٢ must have an average octane rating of at least ٨ and contain at most ٢% sulfur. The crude oil blended to form gasoline ٣ must have an octane rating of at least ٦ and contain at most ١% sulfur. The octane rating and the sulfur content of the three types of oil are given in Table ٢. It costs $٤ to transform one barrel of oil into one barrel of gasoline, and the company refinery can produce up to ١٤,٠٠٠ barrels of gasoline daily.The customers require the following amounts of each gasoline: ٣,٠٠٠ barrels per day from gasoline١; ٢,٠٠٠ barrels per day from gasoline٢; ١,٠٠٠ barrels per day from gasoline ٣. The company considers it an obligation to meet these demands. It also has the option of advertising to stimulate demand for its products. Each dollar spent daily in advertising a particular type of gasoline increases the daily demand for that type of gas by ١٠ barrels.

Table (١):
Gas and Crude Oil Prices for Blending

Gas	Sales Price per Barrel ($)	Crude	Purchase Price per Barrel ($)
1	70	1	45
2	60	2	35
3	50	3	25

Table (٢):
Octane Ratings and Sulfur Requirements for Blending

Crude	Octane Rating	Sulfur Content (%)
1	12	0.5
2	6	2.0
3	8	3.0

Formulate the profits equations while profits(profits _ revenues _ costs).

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Question No. ٢ [٧ degree]

Solution Sunco must make two types of decisions: first, how much money should be spent in advertising each type of gas, and second, how to blend each type of gasoline from the three types of crude oil available. For example, Sunco must decide how many barrels of crude 1 should be used to produce gas 1. We define the decision variables

a_i = dollars spent daily on advertising gas i $\quad (i = 1, 2, 3)$

x_{ij} = barrels of crude oil i used daily to produce gas j $\quad (i = 1, 2, 3; j = 1, 2, 3)$

For example, x_{21} is the number of barrels of crude 2 used each day to produce gas 1.

Knowledge of these variables is sufficient to determine Sunco's objective function and constraints, but before we do this, we note that the definition of the decision variables implies that

$$\begin{aligned} x_{11} + x_{12} + x_{13} &= \text{barrels of crude 1 used daily} \\ x_{21} + x_{22} + x_{23} &= \text{barrels of crude 2 used daily} \\ x_{31} + x_{32} + x_{33} &= \text{barrels of crude 3 used daily} \end{aligned} \tag{38}$$

$$\begin{aligned} x_{11} + x_{21} + x_{31} &= \text{barrels of gas 1 produced daily} \\ x_{12} + x_{22} + x_{32} &= \text{barrels of gas 2 produced daily} \\ x_{13} + x_{23} + x_{33} &= \text{barrels of gas 3 produced daily} \end{aligned} \tag{39}$$

To simplify matters, let's assume that gasoline cannot be stored, so it must be sold on the day it is produced. This implies that for $i = 1, 2, 3$, the amount of gas i produced daily should equal the daily demand for gas i. Suppose that the amount of gas i produced daily exceeded the daily demand. Then we would have incurred unnecessary purchasing and production costs. On the other hand, if the amount of gas i produced daily is less than the daily demand for gas i, then we are failing to meet mandatory demands or incurring unnecessary advertising costs.

We are now ready to determine Sunco's objective function and constraints. We begin with Sunco's objective function. From (39),

$$\begin{aligned} \text{Daily revenues from gas sales} = {} & 70(x_{11} + x_{21} + x_{31}) + 60(x_{12} + x_{22} + x_{32}) \\ & + 50(x_{13} + x_{23} + x_{33}) \end{aligned}$$

From (38),

$$\begin{aligned} \text{Daily cost of purchasing crude oil} = {} & 45(x_{11} + x_{12} + x_{13}) + 35(x_{21} + x_{22} + x_{23}) \\ & + 25(x_{31} + x_{32} + x_{33}) \end{aligned}$$

Also,

$$\text{Daily advertising costs} = a_1 + a_2 + a_3$$

$$\text{Daily production costs} = 4(x_{11} + x_{12} + x_{13} + x_{21} + x_{22} + x_{23} + x_{31} + x_{32} + x_{33})$$

Then,

Then,

$$\begin{aligned}\text{Daily profit} &= \text{daily revenue from gas sales} \\ &\quad - \text{daily cost of purchasing crude oil} \\ &\quad - \text{daily advertising costs} - \text{daily production costs} \\ &= (70 - 45 - 4)x_{11} + (60 - 45 - 4)x_{12} + (50 - 45 - 4)x_{13} \\ &\quad + (70 - 35 - 4)x_{21} + (60 - 35 - 4)x_{22} + (50 - 35 - 4)x_{23} \\ &\quad + (70 - 25 - 4)x_{31} + (60 - 25 - 4)x_{32} \\ &\quad + (50 - 25 - 4)x_{33} - a_1 - a_2 - a_3\end{aligned}$$

Question No. ٣ **[٨ marks]**

There are eight tasks , labeled from A through H. Each task has three time estimate: the optimistic time (O), the normal time (N), and the pessimistic time (P).

Activity	Predecessor	Opt. "O"	Normal "N"	Pess "P"
A	-	٣	٣.٢	٤
B	A	٥	٥	٨
C	A	٤	٤.٥	٥
D	C	٣	٢.٢٥	٣.٦
E	B	٤	٣.٥	٦
F	D	٥	٩	١٣
G	F	٧	٨	١٢
H	D	٣	٩	١٢

Calculate the Following:

١- The expected time for each activity

٢- Estimate the critical path

٣- The early beginning and the late beginning for each activity

٤- The early end and the late end for each activity

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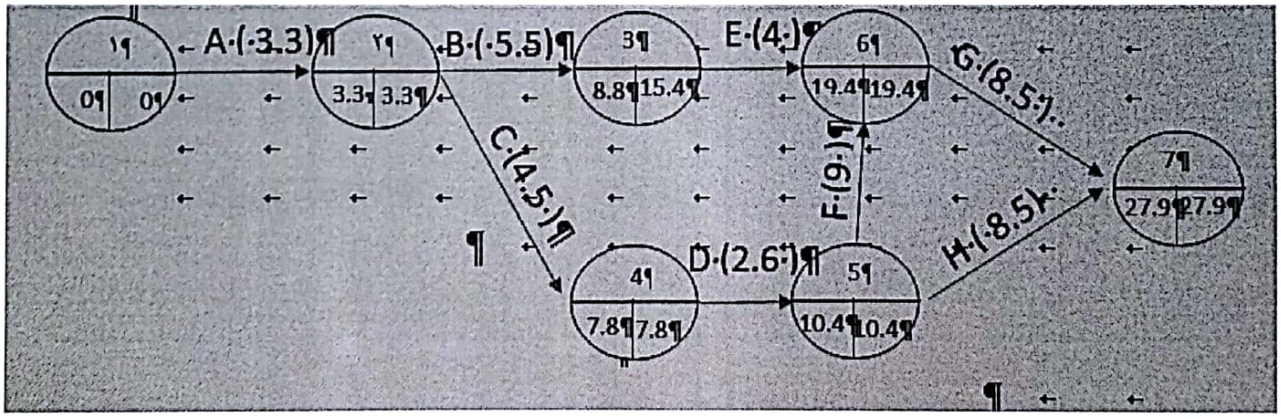
Solution

زمن أداء النشاط = (الوقت المتفائل + ٤ × الزمن الأكثر احتمالا + الزمن المتشائم)
6

رمز النشاط	حدث النشاط	ف	ح	ش	الزمن المتوقع
A	١ ⟶ ٢	٣	٣.٢	٤	٣.٣
B	٢ ⟶ ٣	٥	٥	٨	٥.٥
C	٢ ⟶ ٤	٤	٤.٥	٥	٤.٥
D	٤ ⟶ ٥	٣	٢.٢٥	٣.٦	٢.٦
E	٣ ⟶ ٦	٤	٣.٥	٦	٤
F	٥ ⟶ ٦	٥	٩	١٣	٩
G	٦ ⟶ ٧	٧	٨	١٢	٨.٥



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المسارات :

ABEG ⟶ ٣.٣+٥.٥+٤+٨.٥=٢١.٣

ACDFG ⟶ ٣.٣+٤.٥+٢.٦+٩+٨.٥=٢٧.٩

ACDH ⟶ ٣.٣+٤.٥+٢.٦+٨.٥=١٨.٩

مدة التنفيذ = ٢٧.٩

المسار الحرج ⟵ ACDFG

نهاية مبكرة = بداية مبكرة +مدة التنفيذ

بداية متاخرة = نهاية متاخرة - مدة التنفيذ

جدول المراقبة الزمنية

النشاط	مدة التنفيذ	اوقات مبكرة		اوقات متاخرة		فترة السماح	النشاط الحرج
		بداية	نهاية	بداية	نهاية		
A	٣.٣	٠	٣.٣	٠	٣.٣	٠	حرج
B	٥.٥	٣.٣	٨.٨	٩.٩	١٥.٤	٦.٦	-
C	٤.٥	٣.٣	٧.٨	٣.٣	٧.٨	٠	حرج
D	٢.٦	٧.٨	١٠.٤	٧.٨	١٠.٤	٠	حرج
E	٤	٨.٨	١٢.٨	١٥.٤	١٩.٤	٦.٦	-
F	٩	١٠.٤	١٩.٤	١٠.٤	١٩.٤	٠	حرج
G	٨.٥	١٩.٤	٢٧.٩	١٩.٤	٢٧.٩	٠	حرج
H	٨.٥	١٠.٤	١٨.٩	١٩.٤	٢٧.٩	٩	-

Best wishes

Dr Eng. Sameh Abdel-Hamed