نموذج أسئلة و اجابة مادة الاقتصاد الهندسى م ٥٦١

أستاذ المادة : د. محمد عبد اللطيف الشرنوبى

Benha University College of Engineering at Benha

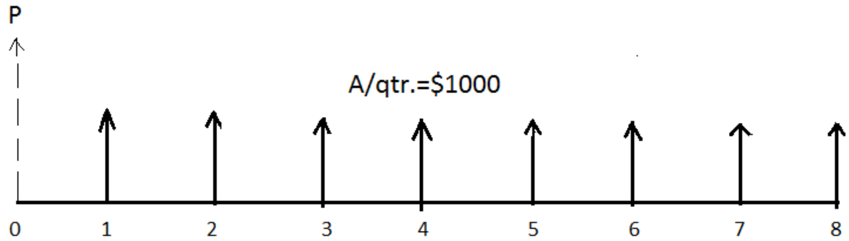
Questions For Final Examination Time :120 min.

Subject: Engineerin Economy January/9/ 2017

Fifth year Structural and production engineering

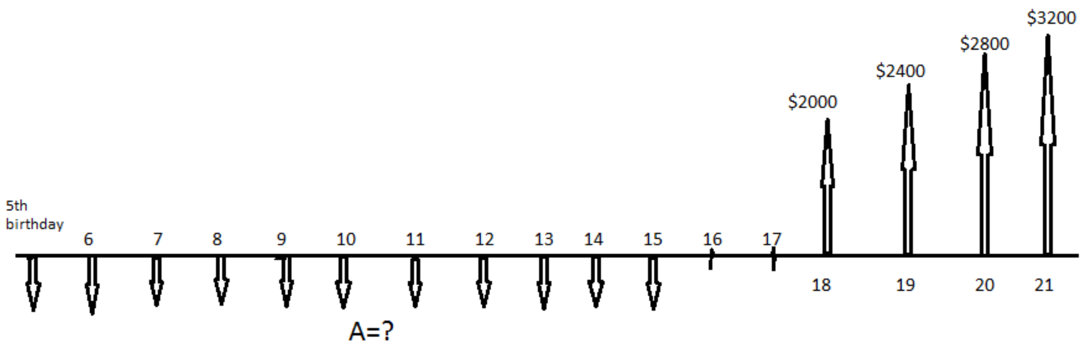
Examiner:Dr.Mohamed Elsharnoby

1-Determine the present equivalent, P, of the this cash flow diagram:



The nominal interest rate is 15% compounded monthly. Cash flows occur every three months (once per quarter)

2-Suppose that the parents of a young child decide to make annual deposits into a savings account, with the first deposit being made on the fifth birthday and the last deposit being made on the fifteenth birthday. Then starting on the child's eighteenth birthday, withdrawals shown below will be made. If the effective interest rate is 8% during this period of time, what are the annual deposits in years fife through fifteen?



3)Three mutually exclusive investment alternatives for implementing an office automation plan in an engineering design firm are being considered. The study period is 10 years, and the useful lives for the three alternatives are also 10 years. Market values of the three alternative are assumed to be zero at the end of their useful lives. If the firms MARR is 10% per year, which alternative should be selected in the view of the following estimates?

	Alternative		
	A	**B**	**C**
Capital investment	**-$390,000**	**-$920,000**	**-$660,000**
Net annual revenues less expenses	**69,000**	**167,000**	**133,500**

4- Three mutually exclusive alternative public works projects are currently under consideration. Their respective costs and benefits are included in th table below. Each of the projects has a useful life of 50 years, and the interest rate is 10% per year. Which if any of these projects should be selected?

	Alternative		
	A	**B**	**C**
Capital investment	**$8,500,000**	**$10,000,000**	**$12,000,000**
Annual oper. &maint costs	**750,000**	**725,000**	**700,000**
Salvage value	**1,250,000**	**1,750,000**	**2,000,000**
Annual benefits	**2,150,000**	**2,265,000**	**2,500,000**

5-Suppose that your salary is $35,000 in year one, will increase at 6% per year through year four, and is expressed in actual dollar as follows:

End of year, K	Salary (A$)
1	$ 35,000
2	37,100
3	39,326
4	41,685

If the general price inflation rate (f) is expected to average 8%per year, what is the real dollar equivalent of these actual dollar salary amounts? Assume that the base dollar value is at year one (K=1)

6) The annual maintenance costs of an electric pump this year are estimated to be $1,800. Since the level of maintenance is expected to be the same in the future, these costs will be constant, assuming no inflation. If the pump's life is predicted to be 13 years, find the present equivalent of its maintenance costs when the annual inflation rate is 9% and the annual market rate is 12%. Solve using:

i) Geometric gradient.

ii) Constant-dollar analysis.

G O O D L U C K

Note: A table of formulae are on the back of the questions if you need.

- ***Single Payment formulas:***

  Compound amount: $F = P (1+i)^n = P (F/P,i,n)$

  Present worth: $P = F (1+i)^{-n} = F (P/F,i,n)$

- ***Uniform Series Formulas:***

  Compound Amount: F $= A\{[(1+i)^n - 1]/i\} = A (F/A,i,n)$

  Sinking Fund: $A = F \{i/[(1+i)^n - 1]\} = F (A/F,i,n)$

  Capital Recovery A $= P \{[i(1+i)^n]/[(1+i)^n - 1] = P (A/P,i,n)$

  Present Worth:P $= A\{[(1+i)^n - 1]/[i(1+i)^n]\} = A (P/A,i,n)$

- ***Arithmetic Gradient Formulas:***

  Present Worth P $= G \{[(1+i)^n - i\,n - 1]/[i^2 (1+i)^n]\} = G (P/G,i,n)$

  Uniform Series A $= G \{[(1+i)^n - i\,n - 1]/[i (1+i)^n - i]\} = G (A/G,i,n)$

- ***Geometric Gradient Formulas:***

  If $i \neq g$, $P = A \{[1 - (1+g)^n(1+i)^{-n}]/(i-g)\} = A (P/A,g,i,n)$

  If $i = g$, $P = A [n (1+i)^{-1}] = A (P/A,g,i,n)$

- ***Nominal interest rate per year, r*** **: the annual interest rate without considering the effect of any compounding**

- **Effective interest rate per year,** i_a**:**

  $i_a = (1 + r/m)^m - 1 = (1+i)^m - 1$ **with** $i = r/m$

- ***Continuous compounding,*** **:**

  r – one-period interest rate, n – number of periods

  $(P/F,r,n)^{inf} = e^{-rn}$

  $(F/P,r,n)^{inf} = e^{rn}$

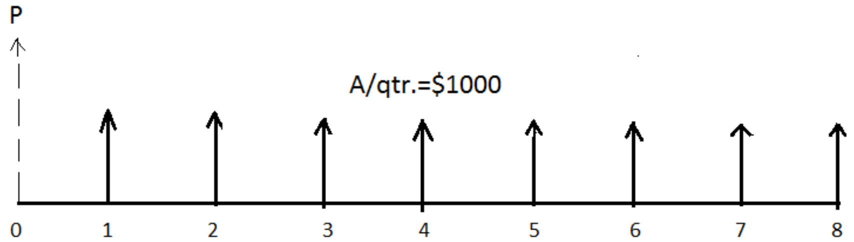
College of Engineering at Benha
Department of Mechanical Eng.
Subject : Turbo machines   Date:9/1/2017

Model Answer of the Final Exam

Elaborated by: Dr. Mohamed Elsharnoby

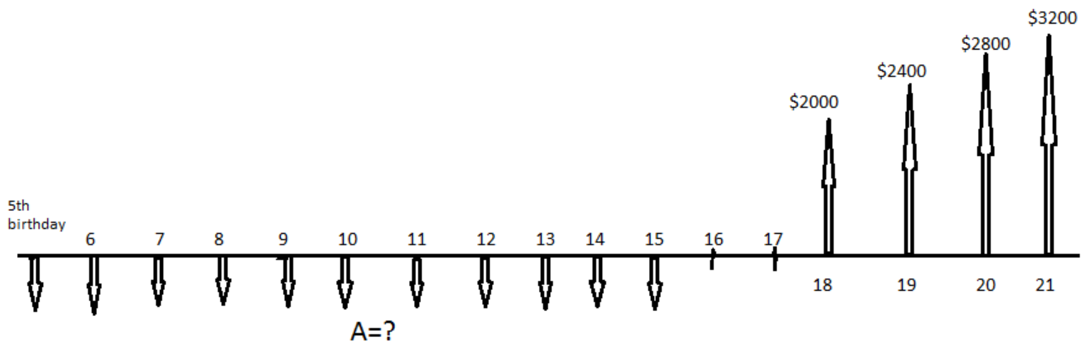
نموذج الاجابة المادة :اقتصاد هندسى م ٥٦١ الغرقة الخامسة
التاريخ الاثنين ٩ يناير ٢٠١٧

أستاذ المادة : د. محمد عبد اللطيف الشرنوبى

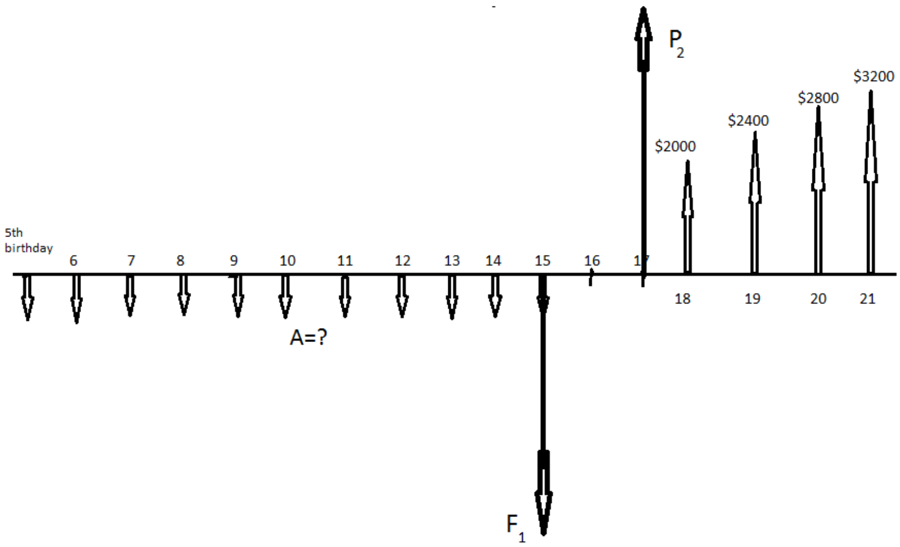


The effective interest rate per period is = $(1+0.015/12)^3-1 = 0.037970703$
Present Worth:P = $A\{[(1+i)^n - 1]/[i(1+i)^n]\}$ = A (P/A,i,n)
1000x6.789522213=$6,789.5

2-



Assume the final values of the series of payments is F_1 and the value of the withdrawals at the 17th birthday is P_1
$F_1=P_1/(1+i)^2$
F_1= A (F/A,i,n)= A (F/A,8%,11)= 16.6455A
P_1=2000 (P/A,8%,4) +400 (P/G,8%,4)=2000x3.3121+400x4.6501
=6624.2 +1860.04=8484.24
F_1= 16.6455A=7273.8683
A=436.985=437



3-For alternative A
(A/P,I,10) = 0.176923 From table interest rate is approximately = 12%
-For alternative B
(A/P,I,10) = 0.18152174 From table interest rate is approximately = 12.6%

-For alternative C
(A/P,I,10) = 0.202272727 From table interest rate is approximately = 15.6%
Alternative C has the maximum rate of return
$\Delta A/\Delta P$ = 34000/260,000=0.13077
The internal rate of return is <6%<MARR
Alternative C is chosen.

4-We shall calculate the equivalent annual cos and benefits of each
For alternative A
EACA=8,500,000x(A/P,10%,50)+750,000 =8,500,000x 0.1009+**750,000=$1,607,650**
EABA=1,250,000x(A/F,10%,50)+2.150,000=1,250,000x 0.0009+**2.150,000=$2151125**
Benfit/cost ratio of A =2151125/ 1,607,650 =1.3380555

For alternative B
EACB=10,000,000x(A/P,10%,50)+750,000 =10,000,000x 0.1009+**725,000=$1734000**
EABA=1,250,000x(A/F,10%,50)+2.150,000=1,750,000x 0.0009+**2.265,000=$2266575**
Benfit/cost ratio of B =2266575/ 1734000=1.3071367
For alternative C
EACC=12,000,000x(A/P,10%,50)+700,000 =12,000,000x 0.1009+**700,000=$1,910,800**
EABC=2,000,000x(A/F,10%,50)+2.500,000=2,000,000x 0.0009+**2.500,000=$2501800**
Benfit/cost ratio of C =2501800/ 1,910,800=1.3092945
The best alternative is A

5-

End of year, K	Salary (A$)	Salary(R$)
1	$ 35,000	$35,000
2	37,100	34,351.85
3	39,326	33,715.70
4	41,685	33,090.90

6- Using the geometric gradient with real factor = (1+i)/(1+f)

If $i \neq g$, $P = A\{[1 - (1+g)^n(1+i)^{-n}]/(i-g)\} = A\,(P/A,g,i,n)$

P = 1800*٩.٩١٣٢- = -17843.8 = 1800*1.12=$ 19450

i) **Constant dollar**

i' = (i-f)/(1+f) = 2.٧٥٢٢٩%

Present Worth: $P = A\{[(1+i)^n - 1]/[i(1+i)^n]\} = A\ (P/A,i,n)$

P = 1800 *(٠.٤٢٣٢٧)/(0.0275229*1.42327)=1800*١٠.٨٠٥٤ =19450