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Engineering Economics
ECO 1192
Practice Examination #1

49 Multiple-Choice Questions
Answers are provided on the last page

1. The baseline for the acceptance or rejection of a project using the Present and Future Worth methods is
   a) MARR
   b) Recovery period less than the industry threshold
   c) $0
   d) 1
   e) None of these answers.

2. The baseline for the acceptance or rejection of a project using the Internal (IRR) and the External (ERR) Rate of Return methods is
   a) MARR
   b) Recovery period less than the industry threshold
   c) $0
   d) 1
   e) None of these answers.

3. If the rate of interest is 12% compounded quarterly, the effective (annual) rate of interest is
   a) 3%
   b) 12%
   c) 12.55%
   d) None of these answers.

4. With the Present Worth Method, a common period of analysis must be used to determine the economic validity of two projects with unequal lives.
   a) True

b) False

5. With the Annual Equivalent Worth or Annuity Method (AEW), a common period of analysis must be used to determine the better of two projects with unequal lives.
   a) True
   b) False

6. If the rate of interest is 12% compounded monthly, the actual (monthly) rate of interest is
   a) 12%
   b) 12.68%
   c) 1%
   d) None of these answers.

7. A project with a negative annual equivalent worth (AEW) must have a negative internal rate of return.
   a) True
   b) False

8. A project with a Net Present Worth (NPW) = $0 must have a rate of return
   a) Less than MARR
   b) Greater than MARR
   c) Equal to MARR.

9. A nominal rate of interest will exceed its corresponding effective rate of interest when
   a) simple interest (as opposed to compound interest) is used.
   b) a project has an infinite life.
   c) the effective rate of interest exceeds MARR.
   d) None of these answers.

10. Which nominal (annual) rate of interest compounded semi-annually is equivalent to a monthly rate of 1%?
    a) 12%
    b) 6%
    c) 6.152%
    d) None of these answers.

Questions 11 to 14

Projects A to F

- **are ranked in ascending order of their first cost**
- **have identical lives (N)**
- **have negligible salvage values (SV=0).**

PROJECTS	RATES OF RETURN					
	A	B	C	D	E	F
A	26	-	-	-	-	-
B	24	25	-	-	-	-
C	22	24	22	-	-	-
D	20	21	20	20	-	-
E	19	18	19	18	18	-
F	15	16	17	16	16	17

11. With MARR = 15% and no capital rationing, valid independent projects are:
    a) A, B, C, D and E
    b) A, B, C, D, E and F
    c) E
    e) None of these answers.

12. With MARR = 23% and no capital rationing, valid independent projects are:
    a) A and B
    b) A, B and C
    c) A
    d) None of these answers.

13. With MARR = 15%, the best mutually exclusive project is:
    a) A
    b) C
    c) D
    d) E
    e) None of these answers.

14. With a MARR = 23%, the best mutually exclusive project is:
    a) A
    b) B
    c) D
    d) E
    e) F

15. The Internal Rate of Return (IRR) method assumes that the cash inflows generated by a project will be reinvested at MARR.
    a) True
    b) False

Questions 16 to 24		
DETAILS	**PROJECT A**	**PROJECT B**
First Cost($)	**60,000**	**90,000**
Economic Life (years)	**5**	**10**
Annual Revenues ($)	**30,000**	**30,000**
Annual operating cost ($)	**10,000**	**9,000 in the first year followed by annual decreases of $500 (e.g., 8,500 in year 2; 8,000 in year 3, etc.)**
Salvage Value ($)	**1,000**	**-2,000**
MARR (%)	**10**	**10**

16. Project A's Annual Equivalent Worth can be calculated from answer
    a) -60,000(P/A,10%,5) + 30,000 -10,000 + 1,000(P/F,10%,5)
    b) -60,000 + 30,000 -10,000 + 1,000(P/F,10%,5)
    c) -60,000(A/P,10%,5) + 30,000 -10,000 + 1,000(A/F,10%,5)
    d) -60,000 + 30,000 -10,000 + 1,000
    e) None of these answers.

17. Project A's Present Worth can be calculated from answer
    a) -60,000(P/A,10%,5) + 30,000 -10,000 + 1,000(P/F,10%,5)
    b) -60,000(A/P,10%,5) + (30,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)
    c) -60,000 + (30,000 -10,000) + 1,000(P/F,10%,5)
    d) -60,000 + (30,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)
    e) None of these answers.

18. Project A's Internal Rate of Return (i*) can be calculated from answer
    a) -60,000(A/P,i*%,5) + (30,000 -10,000) + 1,000(A/F,i*%,5) = $0
    b) -60,000 + 30,000 -10,000 + 1,000(P/F,i* = $0
    c) -60,000 + (30,000 -10,000)(P/A,i*,5) + 1,000(P/F,i*,5) = $0
    d) -60,000(F/P,i*,5) + (30,000 -10,000)(F/A,i*,5) + 1,000 = $0
    e) Answers a), c) and d).

19. Project A's External Rate of Return (i*) can be calculated from answer
    a) -60,000(P/A,10%,5) + 30,000 -10,000 + 1,000(P/F,10%,5) = $0
    b) -60,000(F/P,i*%,5) + (30,000 -10,000)(F/A,10%,5) + 1,000 = $0
    c) -60,000 + (30,000 -10,000)(P/F,i*%,5) + 1,000(P/F,10%,5) = $0
    d) -60,000(F/P,i*%,5) + (30,000 -10,000)(P/A,10%,5) + 1,000 = $0
    e) None of these answers.

20. If the average recovery period for projects similar to Project A is 4 years, would Project A be acceptable based on the Simple Payback Method?

a) Yes.
b) No.
c) Need for information to comment on Project A's validity.

21. Project B's Net Future Worth can be calculated from answer
a) -90,000(P/A,10%,10)+21,000-2,000(P/F,10%,10) + 500(P/G,10%,10)
b) -90,000(F/P,10%,10) - 2,000 + 21,000(F/A,10%,10) + 500(F/G,10%10)
c) -90,000(F/P,10%,10) - 2,000 + 21,000(F/A,10%,10) - 500(F/G,10%10)
d) -90,000-2,000(P/F,10%,10) + 21,000(P/A,10%,10) + 500(P/G,10%,10)
e) None of these answers.

22. A friend claims that Project B's Internal Rate of Return (IRR) can be calculated from any of the following equations:
A. -90,000(F/P,i*,10)+21,000(F/A,i*,10)-2,000+500(F/G,i*,10) = $0
B. -90,000+21,000(P/A,i*,10)-2,000(P/F,i*,10)+500(P/G,i*,10) = $0
C. -90,000(A/P,i*,10)+21,000-2,000(A/F,i*,10)+500(A/G,i*,10) = $0

Your view is that
a) Project B's IRR can be calculated from equation A but not equations B and C.
b) Project B's IRR can be calculated from equations A and C but not equation B.
c) Project B's IRR can be calculated from equation C only.
d) Your friend is correct.

23. The incremental internal rate of return (ΔIRR) between projects A and B can be calculated from answer
a) -60,000(A/P,i*,5) + (30,000 -10,000) + 1,000(A/F,i*,5)
= -90,000(A/P,i*,10) + 21,000 - 2,000(A/F,10%,10) + 500(A/G,i*,10)
b) -60,000 + (30,000 -10,000)(P/A,i*,5) + 1,000(P/F,i*,5)
= -90,000 + 21,000-2,000(P/F,i*,10) + 500(A/G,i*,10)
c) -60,000(F/P,i*,5) + (30,000 -10,000)(F/A,i*,5) + 1,000
= -90,000(F/P,i*,10)+21,000(F/A,i*,10)-2,000 + 500(F/G,i*,10)
d) -60,000(A/P,i*,5)(F/A,i*,10) + (30,000 -10,000)(F/A,i*,10) + 1,000{1+(F/P,i*,5)]
= -90,000+21,000(P/A,i*,10)-2,000(P/F,i*,10)-500(F/G,i*,10)}[1+(F/P,i*,5)]
e) None of these answers.

24. The incremental external rate of return (ΔERR) between projects A and B can be calculated from answer
a) -60,000(F/P,i*,5) + (30,000 -10,000)(F/A,10%,5) + 1,000
= -90,000(F/P,i*,10)+21,000-2,000(A/F,10%,10) - 500(A/G,i*,10)
b) -60,000 + (30,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)
= -90,000(F/P,i*,10)+21,000-2,000(A/F,i*,10)+500(A/G,i*,10)
c) -60,000(A/P,i*,5) + (30,000 -10,000) + 1,000(A/F,10%,5)
= -90,000(A/P,i*,10)+21,000-2,000(A/F,i*,10)+500(A/G,i*,10)
d) -60,000{1+(P/F,10%,5)}(F/P,i*,10) + (30,000 -10,000)(F/A,10%,10)
+ 1,000{1+(F/P,10%,5)}
= -90,000(F/P,i*,10)+21,000(F/A,10%,10)-2,000+500(F/G,10%,10)
e) None of these answers

Questions 25 to 27		
DETAILS	**PROJECT A**	**PROJECT B**
First Cost($)	**60,000**	**90,000**
Economic Life (years)	**5**	**10**
Annual Revenues ($)	**30,000**	**50,000**
Annual operating cost ($)	**10,000**	**9,000 in the first year followed by annual decreases of $500 (e.g., 8,500 in year 2; 8,000 in year 3, etc.)**
Salvage Value ($)	**1,000**	**-2,000**
MARR (%)	**10**	**10**

25. Project A's B/C ratio is given by
a) 30,000 ÷ {60,000(A/P,10%,5)+10,000-1,000(A/F,10%,5)}
b) {30,000-10,000} ÷ {60,000(A/P,10%,5)-1,000(A/F,10%,5)}
c) 30,000(P/A,10%,5) ÷ {60,000+10,000(P/A,10%,5)-1,000(P/F,10%,5)}
d) Answer a) and b).
e) Answers a) and c).

26. Project B's B/C ratio is given by
a) 50,000 ÷ {[90,000+(10(9,000)/1.1)](A/P,10%,10)-500((A/G,10%,10)
+2,000(A/F,10%,10)}
b) 50,000(P/A,10%,10) ÷ {90,000+(10(9,000)/1.1) - 500((P/G,10%,10)
+ 2,000(P/F,10%,10)}
c) 50,000(F/A,10%,10) ÷ {[90,000+(10(9,000)/1.1)](F/P,10%,10)-500(F/G,10%,10)
+2,000}
d) Answers a), b) and c) are correct.
e) Answers a), b), and c) are incorrect.

27. The incremental B/C ratio between project's A and B is given by
a) (50,000-30,000) ÷ {[(90,000+10(9,000)/1.1)(A/P,10%,10)-500((A/G,10%,10)
+2,000(A/F,10%,10)]-[60,000(A/P,10%,5)+10,000-1,000(A/F,10%,5)]}
b) [50,000(P/A,10%,10)-30,000(P/A,10%,5)]/{[90,000+10(9,000)/1.1-500((P/G,10%,10)
+2,000(P/F,10%,10)]-[60,000+10,000(P/A,10%,5)-1,000(P/F,10%,5)]}
c) [50,000(F/A,10%,10)-30,000(F/A,10%,5)] ÷ {[(90,000+10(9,000)/1.1))(F/A,10%,10)
-500((F/G,10%,10)+2,000]-[60,000(F/P,10%,5)+10,000(F/A,10%,5)-1,000]}
d) b) and c) are correct.
e) a), b), and c) are incorrect.

28. If a project's Net Present Worth (NPW) is negative (< $0), its annual equivalent worth (AEW) must be
a) greater than MARR
b) = MARR
c) greater than $0
d) less than $0.

29. You must select the best of 10 mutually exclusive projects using the incremental internal rate of return method (ΔIRR). Before performing pair-wise project comparisons, you
a) must determine the validity of all (ten) projects.
b) must ensure that at least one project is valid.
c) need not bother verifying the validity of any of the projects since the "best" project is simply the best of the whole lot.

30. Using the External Rate of Return Method (ERR), a common period of analysis is required to determine the better of two mutually exclusive projects of different duration.
a) True
b) False

31. A project's external rate of return (ERR) is the same whether calculated using the Net Present Worth (NPW) Method or the Annual Equivalent Method (AEW).
a) True
b) False

32. A project found to be valid using the Simple Payback Method must also be valid based on the Present Worth Method (PW)?
a) True
b) False

33. If MARR > 0%, a project's recovery period will be shorter with the Discounted Payback Method than with the Simple Payback Method?
a) True
b) False

34. The External Rate of Return method (ERR) assumes that the cash inflows generated by a project will be reinvested at
a) a predetermined rate such as MARR
b) the project's calculated external rate of return.

35. The baseline for accepting or rejecting a project using the simple payback method is
a) MARR
b) 1
c) $0
d) the project's industry threshold (average duration or life).

36. If two (2) projects have identical (equal) recovery periods using the discounted payback

method, they must have the same Net Present Worth.
a) True
b) False

37. The Present Worth Method (PW) and the Discounted Payback Method are based on
a) profitability and liquidity criteria respectively
b) liquidity and equity criteria respectively
c) profitability and integrity criteria respectively.
d) opportunity and repeatability criteria respectively.

38. If a project's annual equivalent worth (AEW) is $0, its internal rate of return must be
a) 0%
b) positive but less than MARR
c) greater than MARR
d) = MARR.

39. If IRR > MARR, then IRR > ERR > MARR?
a) True
b) False

40. If IRR = MARR, then IRR = ERR = MARR?
a) True
b) False

Questions 41 to 43

DETAILS	PROJECT A	PROJECT B
First Cost($)	60,000	90,000
Economic Life (years)	5	10
Annual Revenues ($)	**45,000 at EOY1 decreasing by 15% each year thereafter**.	30,000
Annual operating cost ($)	10,000	**9,000 at EOY1 increasing by 10% each year thereafter.**
Salvage Value ($)	1,000	-2,000
MARR (%)	10	10

41. Project A's Net Present Worth can be calculated from answer
a) $-60{,}000(P/A,10\%,5)+[45{,}000/(0.1-0.15)][1-\{1+0.15/1.1\}^{5}]-10{,}000+1{,}000(P/F,10\%,5)$
b) $-60{,}000+[45{,}000/(0.1+0.15)][1-\{1-0.15/1.1\}^{5}]-10{,}000(P/A,10\%,5)+1{,}000(P/F,10\%,5)$

c) -60,000(A/P,10%,5) + (45,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)
d) -60,000 + (45,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)
e) None of these answers.

42. Project A's Annual Equivalent Worth can be calculated from answer
a) $\{-60,000+[45,000/(0.1+0.15)][1-\{(1-0.15)/1.1\}^5]\}(A/P,10\%,5)-10,000+1,000(A/F,10\%,5)$
b) $-60,000+[45,000/(0.1-0.15)][1-\{1+0.15/1.1\}^5]-10,000+1,000(P/F,10\%,5)$
c) -60,000(A/P,10%,5) + (30,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)
d) -60,000 + (30,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)
e) None of these answers.

43. Project A's IRR can be calculated from answer
a) $-60,000(P/A,i*\%,5)+[45,000/(i*\%+0.15)][1-\{(1-0.15)/(1+i*\%)\}^5]$
$-10,000+1,000(P/F,i*\%,5)=0$
b) $-60,000+[45,000/(0.1-0.15)][1-\{1+0.15/1.1\}^5]-10,000(P/A,10\%,5)+1,000(P/F,10\%,5)=0$
c) -60,000(A/P,10%,5) + (30,000 -10,000)(P/A,10%,5) + 1,000(P/F,10%,5)=0
d) $-60,000+[45,000/(i*\%+0.15)][1-\{(1-0.15)/(1+i*\%)\}^5]$
$-10,000(P/A,i*\%,5)+1,000(P/F,i*\%,5)=0$

Questions 41 to 43

DETAILS	PROJECT A	PROJECT B
First Cost($)	60,000	90,000
Economic Life (years)	5	10
Annual Revenues ($)	**45,000 at EOY1 decreasing by 15% each year thereafter**.	30,000
Annual operating cost ($)	10,000	**9,000 at EOY1 increasing by 10% each year thereafter.**
Salvage Value ($)	1,000	-2,000
MARR (%)	10	10

44. Project B's Net Present Worth can be calculated from answer
a) $-90,000(P/A,10\%,10)+30,000(P/A,10\%,10)-[9,000/(0.1-0.1)][1-\{1+0.1/1.1\}^{10}]$
$-2,000(P/F,10\%,10)$
b) $-90,000(F/A,10\%,10)+30,000(F/A,i*\%,10)-[9,000/(0.1-0.1)][1-\{1+0.1/1.1\}^{10}]$
$-2,000(F/P,i*\%,10)$
c) $-90,000+30,000(P/A,10\%,10)-10[9,000/(1+0.1)]-2,000(P/F,10\%,10)$
d) $-90,000+(30,000-9,000)(P/A,10\%,10)$
e) None of these answers.

45. Project B's AEW can be calculated from answer
a) $-90,000(A/P,10\%,10)+30,000-[9,000/(1+0.1)][1-\{1+0.1/1.1\}^{10}]$
$-2,000(A/F,10\%,10)$
b) $-90,000(A/P,10\%,10)+30,000-\{10[9,000/1.1](A/P,10\%,10)-2,000(A/F,10\%,10)$
c) $-90,000(A/F,10\%,10)+30,000-5[9,000/(0.1]-2,000(A/F,10\%,10)$
d) $-90,000+(30,000-9,000)(P/A,10\%,10)$
e) None of these answers.

46. Project B's IRR can be calculated from answer
a) $-90,000(A/P,i^*\%,10)+30,000-[9,000/(1+i^*]-2,000(A/F,i^*\%,10)=0$
b) $\{-90,000-[9,000/(1+i^*)]\}(A/P,i^*\%,10)+30,000-2,000(A/F,i^*\%,10)=0$
c) $-90,000(A/F,i^*\%,10)+30,000-5[9,000/(0.i^*]-2,000=0$
d) $-90,000(F/P,i^*\%,10)+30,000(F/A,i^*\%,10)-[9,000/(i^*-0.1)][1-\{(1+0.1)/(1+i^*)\}^{10}](F/P,i^*10)$
$-2,000=0$
e) None of these answers.

47. Project B's ERR can be calculated from answer
a) $-90,000(P/F,i^*\%,10)+30,000(F/A,10\%,10)-[9,000/(0.1-0.1)][1-\{1+0.1/1.1\}^{10}]$
$-2,000=0$
b) $-90,000(F/P,i^*\%,10)+30,000(F/A,10\%,10)-10[9,000/(1+0.1)](F/P,10\%,10)$
$-2,000=0$
c) $-90,000+30,000(P/A,10\%,10)-5[9,000/(0.1]-2,000(P/F,10\%,10)=0$
d) $-90,000+(30,000-9,000)(P/G,10\%,10)-2,000(P/F,10\%,10=0$
e) None of these answers.

48. A project with a B/C ratio > 1 must have a Net Present Worth (NPW) > \$0.
a) True; b) False.

49. If the incremental B/C ratio for projects A and B exceeds 1, the incremental IRR (and the incremental ERR) for projects A and B must exceed MARR.
a) True; b) False.

o-o-o

Questions	Answers
1	C
2	A
3	C $[1 + (0.12/4)]^4 - 1$
4	B
5	B
6	C
7	B (must be less than MARR but not necessarily negative)
8	C
9	D (a nominal rate cannot exceed its effective rate)
10	D $\{(1+0.01)^{12} - 1\} = \{[1+(x/2)]^2 - 1\}$; Solve for "x"; Nominal rate (x) =12.304%
11	B
12	A
13	E (F is the NPW best project)
14	B
15	B
16	C
17	D
18	E
19	B
20	A (Project A takes 3 years relative to 4 years on average)
21	B
22	D
23	E
24	D
25	E
26	D
27	A
28	D
29	B
30	A (yes because ERR is a single sum method)
31	B (You cannot use neither AEW nor NPW to calculate a project's ERR)
32	B [Sheer coincidence if it is]
33	B
34	A
35	D
36	B
37	A
38	D

39	**A**
40	**A**
41	**B**
42	**A**
43	**D**
44	**C**
45	**B**
46	**D**
47	**B**
48	**A**
49	**A**