

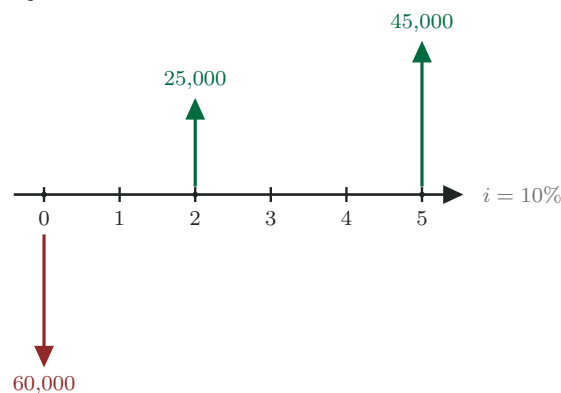
ISE 307: Engineering Economic Analysis (Term 253)**Quiz 1, Version B**

1. The padel club's annual maintenance cost starts at 6,000 SAR and rises by a fixed 1,500 SAR each year. The coffee shop's annual supplies cost starts at 6,000 SAR and rises by a fixed 10% each year. The padel club and coffee shop costs follow, respectively:
 - (A) a uniform series and a geometric gradient.
 - (B) a geometric gradient and a linear gradient.
 - (C) two linear gradients with different starting amounts.
 - (D) a linear gradient and a geometric gradient.
2. The smart vehicle fleet project will save 22,000 SAR per year for 5 years, but the *first* saving occurs at the end of year 3 (it is deferred). At $i = 10\%$, the present worth of these savings today is:
 - (A) $22,000 (P/A, 10\%, 5) = 83,398$ SAR
 - (B) $22,000 (P/A, 10\%, 5) (F/P, 10\%, 2) = 100,911$ SAR
 - (C) $22,000 (P/A, 10\%, 5) (P/F, 10\%, 4) = 56,961$ SAR
 - (D) $22,000 (P/A, 10\%, 5) (P/F, 10\%, 2) = 68,920$ SAR
3. The coffee shop has 18,000 SAR today in a fund earning 8% compounded annually and needs the fund to reach 30,000 SAR to buy a new roaster. The number of *full* years it must wait is:
 - (A) 6 years, using the Rule of 72.
 - (B) not possible, the coffee shop will never reach 30,000 SAR with only 18,000 SAR today.
 - (C) 6 years, because 6.64 rounds down to 6.
 - (D) 7 years, because the target is reached only during the 7th year.
4. The coffee shop invests 80,000 SAR in a new espresso and roasting setup and expects the asset to be worth 120,000 SAR after 4 years, with no cash in between. The annual rate of return is closest to:
 - (A) 12.5%
 - (B) 10.7%
 - (C) 15.0%
 - (D) 8.4%
5. You plan to retire and receive equal annual payments of 150,000 SAR forever from a retirement plan, with the first payment in year 2066. How much must be in the plan by year 2065, if the interest rate is 12%?
 - (A) 1,250,000 SAR
 - (B) not possible, since an infinite series of payments has an infinite present worth.
 - (C) 1,500,000 SAR
 - (D) 1,800,000 SAR

6. The college receives 1,000,000 SAR to fund an ISE 307 scholarship for $N = 10$ years and is comparing two payout plans of equal present worth:
- **Plan A:** an increasing linear gradient, paying A_A in year 1 and rising by G each year, so the year-10 payment is $A_A + 9G$.
 - **Plan B:** a fixed amount A_B each year, from year 1 to year 10.

Which statement about A_B is correct?

- (A) greater than the first-year payment A_A but less than the last-year payment $A_A + 9G$.
 (B) equal to the first-year payment A_A .
 (C) greater than the last-year payment $A_A + 9G$.
 (D) less than the first-year payment A_A .
7. The smart vehicle fleet operator will leave 30,000 SAR in reserve for 6 years. Bank A offers 11% simple interest; Bank B offers 10% compounded annually. After 6 years:
- (A) Bank A holds more, because 11% exceeds 10%.
 (B) the two are equal, since $11\% \times 6$ and $10\% \times 6$ are close.
 (C) Bank B holds more, by about 3,347 SAR.
 (D) Bank A holds more, by about 3,347 SAR.
8. The padel club wants to accumulate 250,000 SAR in 6 years to build a second set of courts, depositing an equal amount at the end of each year into an account paying 8%. The required annual deposit is:
- (A) $250,000/6 = 41,667$ SAR
 (B) $250,000 (A/F, 8\%, 6) = 34,075$ SAR
 (C) $250,000 (A/F, 8\%, 5) = 42,625$ SAR
 (D) $250,000 (A/P, 8\%, 6) = 40,250$ SAR
9. For the smart vehicle fleet project, the transactions are summarized in the cash flow diagram below. The equivalent single value at *year 3* at $i = 10\%$ is closest to:



- (A) -11,400 SAR
 (B) -15,172 SAR
 (C) -45,000 SAR
 (D) +10,000 SAR
10. A single payment F at year 5 and a single payment P at year 0 are equivalent at $i = 8\%$. If we recompute at $i = 12\%$ instead, then to stay equivalent to the *same* F :
- (A) P and F both change.
 (B) P is unchanged, because F did not change.
 (C) P must be smaller than before.
 (D) P must be larger than before.

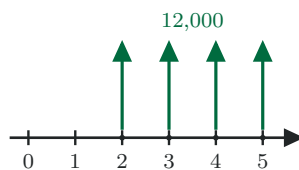
11. A campus delivery robot upgrade is expected to avoid costs of 25,000 SAR in year 1, 40,000 SAR in year 3, and 35,000 SAR in year 4. At $i = 10\%$, the most the team should pay for the upgrade today is:

(A) $25,000 (P/F, 10\%, 4) + 40,000 (P/F, 10\%, 3) + 35,000 (P/F, 10\%, 1) = 78,946$ SAR
 (B) $25,000 + 40,000 + 35,000 = 100,000$ SAR
 (C) $25,000 (P/F, 10\%, 1) + 40,000 (P/F, 10\%, 3) + 35,000 (P/F, 10\%, 4) = 76,684$ SAR
 (D) $25,000 (F/P, 10\%, 1) + 40,000 (F/P, 10\%, 3) + 35,000 (F/P, 10\%, 4) = 131,984$ SAR

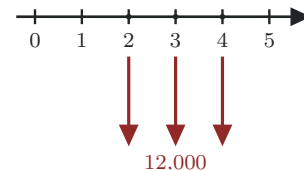
12. The **ISE-y Coffee**, an engineering economics student-group-run coffee shop, will receive a sponsorship payment of 120,000 SAR either now or the same amount at year 3 (when the students graduate). Which option should the group choose to make it the most valuable economically, and why?

(A) Depends on the interest rate.
 (B) Now, because it is discounted over fewer years (0 years, in this case).
 (C) Either, they are the same because the payment is 120,000 SAR in both cases.
 (D) Year 3, because it is discounted over more years, so its worth is higher.

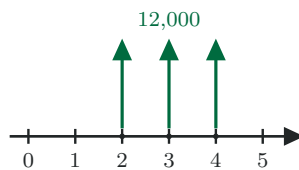
13. A campus delivery robot team will receive a 12,000 SAR grant per year for 3 years to fund an inspection module, with the *first* receipt at the end of year 2. Which diagram is correct?



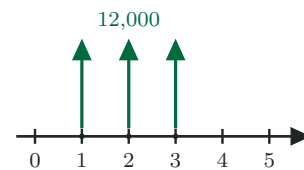
(A)



(C)



(B)



(D)

14. Money has time value mainly because:

(A) money available now can be put to productive use and earn a return over time.
 (B) future payments are always uncertain to arrive.
 (C) paper currency loses physical value as it ages.
 (D) banks are required by law to pay interest.

15. An EV charging stations operator has two offers equal in value at 9%: pay 60,000 SAR now, or pay a fixed amount each year for 6 years. If the true market rate turns out to be *higher* than 9%, then compared at that higher rate:

(A) the two remain equal, because they were set equal.
 (B) the lump-sum plan now has the lower present worth.
 (C) the yearly-payment plan now has the lower present worth.
 (D) neither can be compared without the exact payment amount.