

Digital Finance — Extended Practice Bank
96 Practice Questions Across All 8 Modules (Optional; No Final Exam)

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Digital Finance — BSc Course

PRACTICE ONLY — NOT GRADED

- **This course has NO final written examination.** Per the syllabus, the graded assessment is:
 - Semester Project: 50%
 - Presentation: 20%
 - Lesson Quizzes: 30% (best 6 of 8 modules)
- **Purpose:** This bank is provided purely as an *optional* self-review resource. Use it to consolidate understanding across modules.
- **Format:** All 96 questions use multiple-choice (a)(b)(c)(d), short-answer (1–3 sentences), or calculation formats — aligned with the lesson quizzes and `exam_prep_guide.pdf`.
- **No grading:** Nothing in this bank counts toward your final grade.

practice; no final exam. See `v4/syllabus/v4_syllabus.pdf` for the binding assessment scheme.

How to Use This Practice Bank

- **96 questions:** 12 per module (4 Basic, 4 Applied, 4 Advanced)
- **Three tiers:**
 - **Basic (QB):** Concept-recall MC — tests whether you understand the fundamentals
 - **Applied (QP):** Calculations or applied MC — tests whether you can use concepts
 - **Advanced (QA):** Short-answer critical evaluation — tests whether you can weigh evidence
- **Numbering:** QB1.1 = Basic, Module 1, Question 1; QP3.2 = Applied, Module 3, Question 2; QA8.4 = Advanced, Module 8, Question 4
- **Study strategy:** Try each question before checking the answer key. For MC, eliminate distractors; for short-answer, write 1–3 sentences before comparing.
- **Answers:** See `exam_bank_solutions.pdf` (instructor copy).

MC

distractors are deliberately plausible — they encode common misconceptions. Identifying why a distractor is wrong is itself a learning outcome.

Module 1: Cost — Basic Questions (MC)

QB1.1 [Basic, MC] A “payment intermediary” is best defined as:

- a Any bank that holds a customer deposit.
- b An entity that sits between payer and payee to facilitate a transaction (e.g., card network, clearinghouse, correspondent bank).
- c A regulator that supervises payment flows.
- d A software vendor that sells POS terminals.

QB1.2 [Basic, MC] A domestic ACH transfer in the US takes 1–3 business days while a Bitcoin transfer confirms in ~10 minutes because:

- a ACH uses batch settlement cycles, while Bitcoin broadcasts transactions peer-to-peer and confirms them in the next block.
- b ACH is encrypted while Bitcoin is not.
- c Bitcoin miners are paid more than ACH operators.
- d ACH transactions are physically transported.

QB1.3 [Basic, MC] An “interchange fee” is:

- a Paid by the cardholder to the issuing bank.
- b Paid by the acquirer (merchant’s bank) to the issuer (cardholder’s bank), passed to the merchant via the MDR.
- c A regulatory surcharge imposed by central banks.
- d The merchant’s monthly terminal rental.

QB1.4 [Basic, MC] The difference between a payment *processor* (Stripe) and a payment *network* (Visa) is:

- a They are synonyms.
- b Processors route authorisation/clearing messages for merchants; networks define rules, set interchange, and connect issuers and acquirers.

Module 1: Cost — Applied Questions

QP1.1 [Applied, Calc] A European tourist pays EUR 100 by credit card in Japan. FX markup is 2.5%, interchange is 1.5%. Compute (i) FX markup cost, (ii) interchange cost, (iii) total cost to the cardholder *and* the cost deducted from the merchant's settlement. Show units.

QP1.2 [Applied, MC] Compared with a traditional bank, a neobank (e.g., Revolut) typically:

- a Earns most revenue from net interest margin on deposits.
- b Earns most revenue from interchange on debit/credit usage plus subscription tiers and FX markups; NIM is small because deposits are small.
- c Earns 100% of revenue from ATM fees.
- d Has no revenue model (neobanks are non-profits).

QP1.3 [Applied, MC] PayPal charges 2.9% + \$0.30 per transaction while ACH is nearly free because:

- a PayPal is a two-sided platform bearing chargeback risk and providing instant authorisation; ACH is a utility rail with batch settlement and no chargeback window.
- b PayPal lobbies for higher fees.
- c ACH is subsidised by the US Treasury.
- d PayPal's servers cost more than ACH's.

QP1.4 [Applied, MC] The primary winners from instant-payment systems (FedNow, SEPA Instant) are:

- a Correspondent banks with cross-border pipelines.
- b Merchants (faster settlement, lower working-capital) and low-income payees; the main losers are card networks and short-term lenders who monetised float.
- c Credit card issuers.
- d High-frequency traders.

MC tests the ability to reason about who captures value in a payment stack.

Module 1: Cost — Advanced Questions (Short Answer)

QA1.1 [Advanced, Short] “Financial intermediaries will be completely replaced by blockchain-based payment systems within 10 years.” In 2–3 sentences, give *one* counter-argument citing specific evidence (cost, regulation, or UX) from Modules 1 or 3.

QA1.2 [Advanced, MC] The UN SDG target for cross-border remittance cost is 3%. The best-positioned mechanism to hit this target *today* for a US→Philippines corridor is:

- a Traditional correspondent banking.
- b A mobile-money-to-mobile-money rail (e.g., M-Pesa → GCash) or a regulated stablecoin rail (USDC on Solana/Polygon) paired with licensed cash-out — both typically deliver end-to-end cost $\leq 3\%$.
- c A physical courier service.
- d Western Union counter-to-counter cash.

QA1.3 [Advanced, MC] BNPL (e.g., Klarna) *increases* the total consumer cost of financial services when:

- a Consumers pay on time, always.
- b Merchants absorb the BNPL MDR fully.
- c Consumers miss instalments (triggering late fees), buy larger baskets than they would otherwise afford, or take BNPL on top of credit-card revolving debt.
- d BNPL is regulated.

QA1.4 [Advanced, Calc] Compute the all-in cost to process a \$100 payment via: (a) credit card (MDR 2.5%), (b) ACH (flat \$0.25), (c) USDC stablecoin on Polygon (assume \$0.01 network fee + 0.1% on/off-ramp). Rank cheapest to most expensive and state the regulatory catch for the cheapest option.

Adva

questions require one clear argument with a concrete data point, not a long essay.

Module 2: Access — Basic Questions (MC)

QB2.1 [Basic, MC] “Financial exclusion” most accurately refers to:

- a Any adult without a credit card.
- b The state of lacking access to (or being priced out of) basic financial services: account ownership, affordable credit, insurance, and safe savings channels.
- c People who choose not to invest in equities.
- d High-net-worth individuals avoiding retail banks.

QB2.2 [Basic, MC] Credit scoring can perpetuate inequality because:

- a The formulae are classified.
- b Thin-file and no-file populations are systematically denied, and historical repayment data reflects past unequal access to credit, so the model learns existing patterns.
- c Banks are legally required to exclude minorities.
- d Scoring is always random.

QB2.3 [Basic, MC] “Algorithmic bias” in financial services means:

- a A model with high variance.
- b A systematic error that disadvantages a protected group, arising from biased training data, biased labels, or biased feature selection.
- c Any model with an accuracy below 99%.
- d A bug in the code.

QB2.4 [Basic, MC] M-Pesa (Kenya, 2007) enabled financial access primarily by:

- a Issuing credit cards to all Kenyans.
- b Letting any feature-phone user send/receive value via SMS using airtime-linked balances cashed in and out at a dense human-agent network — no bank account required.

QP2.1 [Applied, MC] A credit-scoring model rejects ZIP-code 60637 at $3\times$ the national rate. This is likely proxy discrimination (Lesson 2.2) because:

- a) ZIP code is a neutral geographic descriptor with no correlation to protected class.
- b) ZIP code is highly correlated with race in segregated cities; even if ZIP is not a protected attribute, it acts as a proxy and the disparate impact is actionable under ECOA / EU AI Act.
- c) The model is perfectly fair because ZIP is not a protected class.
- d) $3\times$ is within normal variation.

QP2.2 [Applied, MC] The tradeoff between traditional FICO and alternative-data scoring (social, phone) is best summarised as:

- a) Alternative data is strictly better.
- b) Alternative data can expand access to thin-file applicants but raises consent, drift, and proxy-discrimination risks; FICO is narrower but better regulated and contestable.
- c) Both are identical.
- d) FICO is illegal.

QP2.3 [Applied, Calc] Before fractional shares, buying one share of Amazon at \$3,300 required \$3,300. A platform offering fractional shares at \$1 minimum reduces the minimum viable investment by what factor? Express as a ratio and as a percent.

QP2.4 [Applied, MC] A robo-advisor at 0.25% vs. a human advisor at 1%: the cost delta *alone* does not explain democratisation because:

- a) Robo-advisors are more expensive.
- b) Low minimum balances (often \$0–\$500), digital onboarding, automated rebalancing, and tax-loss harvesting all lower *time* and *friction* barriers — which matter as much as fee level for first-time investors.

Module 2: Access — Advanced Questions (Short Answer)

QA2.1 [Advanced, Short] “Financial inclusion through technology inevitably leads to financial over-inclusion (predatory lending, gambling-like trading).” In 2–3 sentences, state one condition under which this is true and one policy lever that mitigates it.

QA2.2 [Advanced, MC] Designing credit-scoring for first-generation immigrants with no local credit history, the *least* problematic data source is:

- a Social-media posts.
- b Rental-payment history, utility-bill history, and (with consent) bank-account cash-flow data — each has a clear causal link to repayment capacity and is contestable.
- c Ethnic background.
- d Purchase history for alcohol.

QA2.3 [Advanced, Short] In 2–3 sentences, argue whether gamification of retail trading (confetti, streaks, push notifications) is net democratising or net exploitative. Cite *one* concrete harm (e.g., GameStop retail losses, Robinhood Alex Kearns case).

QA2.4 [Advanced, MC] PSD2 / open banking in the EU has:

- a Only increased access, with no downsides.
- b Expanded access by forcing banks to share data with licensed TPPs (aiding aggregators, lending fintechs) but also raised consent-fatigue, phishing-vector, and data-monopoly-for-big-tech risks.
- c Eliminated the need for banks entirely.
- d Been repealed.

items reward concrete evidence over general claims.

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Module 3: Trust — Basic Questions (MC)

QB3.1 [Basic, MC] The “double-spend problem” in digital cash is that:

- a) Users buy two coffees at once.
- b) Without a central ledger, a digital coin (being a file) can be spent twice; Bitcoin solves this via a globally visible, cryptographically linked block history and a consensus rule that only the longest valid chain counts.
- c) Banks double-count deposits.
- d) Every transaction confirms twice.

QB3.2 [Basic, MC] Proof-of-Work (PoW) vs. Proof-of-Stake (PoS):

- a) Both use electricity identically.
- b) PoW secures the chain via costly computation (energy-as-sybil-deterrent); PoS secures it via economic stake (capital-as-sybil-deterrent), with different attack surfaces (51% hashpower vs. slashing/stake-centralisation).
- c) PoS is always insecure.
- d) PoW and PoS are synonyms.

QB3.3 [Basic, MC] A smart contract is:

- a) A legal agreement signed electronically.
- b) Code deployed to a blockchain that executes deterministically when called; e.g., a Uniswap AMM pool whose swap function enforces the constant-product rule automatically.
- c) Any mobile app.
- d) A contract negotiated by an AI.

QB3.4 [Basic, MC] DeFi lending uses over-collateralisation (typically $\geq 150\%$) because:

- a) Borrowers like paying more.
- b) Without a legal system for enforcing uncollateralised claims *and* with volatile crypto collateral, excess collateral provides the cushion to liquidate before the loan goes underwater.

Module 3: Trust — Applied Questions

QP3.1 [Applied, Calc] A DeFi protocol liquidates when the collateralisation ratio falls to 150% (*i.e.* 150% is the liquidation threshold; margin calls begin at 175%). A user deposits 10 ETH at \$3,000/ETH (collateral \$30,000) and borrows \$20,000 DAI. Compute the ETH liquidation price. Show the formula $\text{Ratio} = \frac{\text{Collateral Value}}{\text{Debt}} \geq 150\%$.

QP3.2 [Applied, MC] Comparing Coinbase (CEX) vs. Uniswap (DEX) on custody, KYC, and finality:

- a Both are custodial and both require KYC.
- b Coinbase custodies user assets and enforces KYC; Uniswap is non-custodial (users hold their own keys) and enforces no KYC at the protocol layer, though front-ends may geoblock.
- c Uniswap is custodial.
- d Neither enforces KYC.

QP3.3 [Applied, MC] Bitcoin ~ 7 TPS vs. Visa $\sim 65,000$ TPS: the blockchain trilemma says:

- a You can always have all three of decentralisation, security, and scalability.
- b Given current architectures, any design typically sacrifices one of {decentralisation, security, scalability}; Bitcoin chose decentralisation + security, yielding low TPS; layer-2 (Lightning, rollups) addresses scale off-chain.
- c The trilemma is wrong.
- d Visa uses a blockchain.

QP3.4 [Applied, MC] The Terra-UST collapse (May 2022) is best explained by:

- a A cyberattack on the Terra validators.
- b A reflexive death spiral: UST peg break \rightarrow redemptions mint more LUNA \rightarrow LUNA price collapse \rightarrow more UST depegs \rightarrow more LUNA minted; the algorithmic design offered no exogenous collateral floor.
- c A regulatory shutdown.
- d A successful attack on Ethereum.

is now fully gradeable: liquidation threshold is specified (150%); margin-call level (175%) is informational.

Module 3: Trust — Advanced Questions (Short Answer)

QA3.1 [Advanced, Short] “Smart contracts make lawyers obsolete.” In 2–3 sentences, name *one* circumstance where code \neq law (e.g., ambiguous real-world input, oracle failure, court-ordered reversal, regulatory intervention).

QA3.2 [Advanced, MC] A robust DAO governance design for a student investment fund requires:

- a One-token-one-vote with no timelock.
- b Quorum thresholds, timelocked execution (so members can exit), quadratic or reputation-weighted voting to dampen whale dominance, an explicit dispute channel (e.g., Kleros), and off-chain dispute fallbacks for real-world obligations.
- c Majority vote with no safeguards.
- d A sole administrator.

QA3.3 [Advanced, Short] In 2–3 sentences, argue whether USDT and USDC represent genuine innovation or merely replicate banking risk without equivalent safeguards. Cite *one* concrete event (USDC Silicon Valley Bank depeg, Tether CFTC settlement, or similar).

QA3.4 [Advanced, MC] The 2016 DAO hard fork precedent is best characterised as:

- a A routine upgrade.
- b A social-consensus override of code-is-law that preserved user funds but set the precedent that, under sufficient community pressure, “immutability” is negotiable — a tension still debated today.
- c A universally applauded decision.
- d A failed fork.

USDC/SVB depeg (March 2023) and UST collapse are canonical counter-examples to “stablecoin = riskless dollar.”

Module 4: Risk — Basic Questions (MC)

QB4.1 [Basic, MC] “95% VaR of \$1M over 1 day” means:

- a There is a 95% probability of losing \$1M tomorrow.
- b On 5% of trading days, the 1-day loss is expected to exceed \$1M (conditional distributional claim); it says nothing about how much exceeds \$1M.
- c Expected loss is \$1M.
- d Maximum possible loss is \$1M.

QB4.2 [Basic, MC] A call option gives the holder:

- a The obligation to buy at the strike price.
- b The *right* (not obligation) to buy the underlying at the strike price on/before expiry; e.g., a \$50-strike call on XYZ is exercised if XYZ trades above \$50.
- c The right to sell.
- d Ownership of the underlying.

QB4.3 [Basic, MC] “Counterparty risk” in derivatives is:

- a The risk that prices move.
- b The risk that the other side of the trade fails to deliver; mitigated by central clearing, margin, and collateral — but materialised in bilateral OTC trades (e.g., Archegos 2021).
- c Market volatility.
- d Interest-rate risk.

QB4.4 [Basic, MC] The three classical banking-book risks are:

- a Credit, liquidity, and reputational.
- b Market risk (prices move), credit risk (counterparty default), and operational risk (systems, people, process).
- c Equity, FX, and commodities.

Module 4: Risk — Applied Questions

QP4.1 [Applied, Calc] A portfolio has daily returns with $\mu = 0.05\%$ and $\sigma = 1.2\%$. Compute the 1-day 95% parametric VaR on a \$10M portfolio ($z_{0.95} = 1.645$, Gaussian assumption). Show: $\text{VaR} = (z\sigma - \mu) \cdot V$. State one reason the Gaussian assumption under-estimates the true risk.

QP4.2 [Applied, MC] Total-return swaps let Archegos Capital (2021) build \$20B+ in exposure without disclosure because:

- a) TRSs were illegal.
- b) The prime-broker took legal ownership of the underlying and passed Archegos the economic exposure, so Archegos avoided 13F equity-disclosure triggers; when prices fell, all brokers unwound at once (fire sale).
- c) Archegos was publicly disclosed throughout.
- d) Archegos used only listed options.

QP4.3 [Applied, Calc] A European call on XYZ: strike \$50, premium \$3, 30 days to expiry. Stock at expiry = \$56. Compute (i) intrinsic value at expiry, (ii) P&L to the long (buyer), (iii) breakeven stock price for the long. Show each step.

QP4.4 [Applied, MC] Comparing tail risk: savings account vs. DeFi yield farm vs. stablecoin:

- a) All three are equally safe.
- b) A DeFi yield farm carries smart-contract + oracle + depeg + counterparty-protocol risk and has the thickest tail; a deposit-insured savings account has the thinnest; stablecoins sit between (depeg tails: USDC 2023, UST 2022).
- c) A savings account has the highest tail risk.
- d) A stablecoin cannot lose value.

Note:

Plan 1 corrected the M4L1 fat-tail bridge-failure math (14,000 years \rightarrow \sim 3.5M years) — review the corrected calculation there.

Module 4: Risk — Advanced Questions (Short Answer)

QA4.1 [Advanced, Short] “VaR is a dangerous metric because it tells you nothing about losses beyond the confidence level.” In 2–3 sentences, state why this critique has merit and name *one* alternative (e.g., Expected Shortfall / CVaR, stress-test suite, PoT / EVT).

QA4.2 [Advanced, MC] Risk limits for a crypto hedge fund with spot + derivatives should include:

- a Only a single daily VaR cap.
- b Gross *and* net notional caps per asset; stress-loss ceilings (e.g., 40% drop & 80% drop scenarios); concentration limits per exchange/counterparty; liquidity-bucket caps; automated circuit breakers on TVL/price-volume triggers.
- c No limits; crypto is too volatile to limit.
- d Only VaR and expected return.

QA4.3 [Advanced, Short] Silicon Valley Bank (March 2023) failed on interest-rate risk — a textbook category. In 2–3 sentences, name the *specific* gap (hint: HTM accounting, duration mismatch, uninsured-deposit concentration, or social-media-accelerated run).

QA4.4 [Advanced, MC] DeFi claims to eliminate counterparty risk; in practice:

- a The claim is fully accurate.
- b DeFi *transforms* counterparty risk into smart-contract risk (bugs), oracle risk (price-feed manipulation), governance risk (admin keys / upgrade attacks), and bridge risk (\$2B+ losses in 2022–2023).
- c DeFi has no risks.
- d The claim applies only to Ethereum.

items reward naming a specific mechanism or event, not a generic complaint.

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Module 5: Automation — Basic Questions (MC)

QB5.1 [Basic, MC] Overfitting in ML is:

- a A model that is too small.
- b A model that fits noise in the training data, yielding high training accuracy but poor out-of-sample performance; for finance, this means a backtest that does not survive live markets.
- c Any model with regularisation.
- d A model with high bias.

QB5.2 [Basic, MC] Supervised vs. unsupervised learning:

- a Both need labels.
- b Supervised uses labelled (x, y) pairs (e.g., credit-scoring: features \rightarrow default yes/no); unsupervised learns structure without labels (e.g., clustering customer-segmentation or anomaly detection for fraud).
- c Supervised has no loss function.
- d Unsupervised requires more data always.

QB5.3 [Basic, MC] Transformers were revolutionary for finance NLP because:

- a They replaced databases.
- b Self-attention removed the sequential bottleneck of RNNs, enabled pre-training on enormous corpora (earnings calls, 10-Ks, news), and produced reusable embeddings (BERT, GPT) that transfer across downstream tasks with little labelled data.
- c They are faster than linear regression in all cases.
- d They eliminate the need for data.

QB5.4 [Basic, MC] Three concrete risks of deploying GenAI/LLMs in financial decisions are:

- a Slow inference, data privacy, and GPU cost.
- b Hallucination (fabricated facts), prompt injection (adversarial input overriding guardrails), and model-drift /

QP5.1 [Applied, Calc] A fraud-detection model has precision 80% and recall 80%. Out of 10,000 transactions with 100 actual frauds, compute (i) true positives, (ii) false negatives, (iii) false positives. Show the definitions $\text{Recall} = \text{TP}/(\text{TP} + \text{FN})$ and $\text{Precision} = \text{TP}/(\text{TP} + \text{FP})$.

QP5.2 [Applied, MC] A rule-based trading system typically outperforms an ML system when:

- a Markets are extremely volatile and non-stationary.
- b The data regime is stable, the signal is well-understood, and interpretability / audit trail matter more than predictive lift; ML wins when regimes shift and there is enough labelled data for adaptation.
- c Never — ML always wins.
- d Never — rules always win.

QP5.3 [Applied, MC] A bank cannot deploy a black-box neural credit model in the EU because:

- a The GDPR forbids any automated decisions.
- b GDPR Art. 22 gives subjects the right to meaningful information on automated decisions; the EU AI Act (high-risk systems, Annex III) adds transparency, risk-management, and post-market-monitoring duties; regulators require explanations of rejections.
- c The EU bans neural networks.
- d Only US banks can use them.

QP5.4 [Applied, MC] An LLM generates “Company X revenue grew 15%” when the truth is 8%. The best frame for this error is:

- a A database lookup bug.
- b Hallucination: the LLM generated a plausible-sounding token sequence optimised for fluency, not truth; mitigations include retrieval-augmented generation (RAG) grounding on audited data, numeric-claim verification, and explicit “I don’t know” tuning.

Module 5: Automation — Advanced Questions (Short Answer)

QA5.1 [Advanced, Short] “AI will replace 50% of analyst jobs within 5 years.” In 2–3 sentences, name one task most automatable (research summarisation, data cleansing) and one least automatable (client-relationship management, judgement under genuine uncertainty).

QA5.2 [Advanced, MC] A defensible MLOps pipeline for credit scoring must include:

- a Only a training script.
- b Versioned data lineage, reproducible training, a hold-out validation set, fairness metrics on protected subgroups, canary deployment, live drift monitoring, documented retraining triggers, and an incident-playbook for adverse outcomes.
- c Only a deployment endpoint.
- d Just a backup.

QA5.3 [Advanced, Short] Knight Capital (2012) lost \$440M in 45 minutes from an autonomous trading system. In 2–3 sentences, name the specific failure (stale code path + no kill switch) and state what safeguard prevents it.

QA5.4 [Advanced, MC] The EU AI Act classifies credit-scoring AI as “high-risk”; the compliance burden:

- a Is trivial.
- b Is non-trivial (data-governance, risk-management, human-oversight, logging, accuracy/robustness tests, CE marking, post-market monitoring) and will raise compliance cost materially, but is proportionate given the protected-class impact of credit decisions.
- c Forbids AI entirely.
- d Applies only to generative AI.

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EU AI Act entered into force August 2024; high-risk obligations phase in through 2026–2027.

QB6.1 [Basic, MC] SWIFT is best described as:

- a A clearing system that settles payments.
- b A secure messaging network (not a settlement rail) carrying MT/ISO-20022 messages between 11,000+ member institutions; settlement occurs via correspondent-banking or RTGS rails.
- c A digital currency.
- d A central bank.

QB6.2 [Basic, MC] RTGS vs. net-settlement:

- a They are identical.
- b RTGS (Fedwire, TARGET2) settles each payment individually in real time in central-bank money — eliminates settlement risk but consumes more liquidity; net-settlement batches and nets offsetting claims — cheaper in liquidity but carries inter-cycle credit risk.
- c RTGS is always cheaper.
- d Net-settlement is illegal.

QB6.3 [Basic, MC] Open banking under PSD2 is:

- a A voluntary bank initiative.
- b A regulatory mandate (PSD2 in the EU, OBIE in the UK) that forces banks to expose customer-consented account and payment-initiation APIs to licensed TPPs; PSD3 / PSR extend scope and harmonise enforcement.
- c A cryptocurrency.
- d An accounting standard.

QB6.4 [Basic, MC] Three core components of a modern core-banking system are:

- a Marketing, legal, and HR.
- b Ledger (double-entry book of record), product engine (accounts, loans, cards), and integration layer (ISO-20022)

QP6.1 [Applied, Calc] A core-banking system processes 1M transactions/day at 99.99% uptime. Compute (i) expected downtime per year in minutes, (ii) expected failed transactions per year assuming uniform flow (365 days). Show each step.

QP6.2 [Applied, MC] SWIFT vs. blockchain cross-border (e.g., Ripple/XRP) on *speed and finality*:

- a SWIFT is instant; Ripple is slow.
- b SWIFT-over-correspondent-banking typically takes 1–3 days with probabilistic finality until settled; Ripple xRapid settles in seconds with cryptographic finality, but regulatory acceptance and liquidity depth for minor corridors remain uneven.
- c Both are instant.
- d Neither ever settles.

QP6.3 [Applied, MC] A BaaS neobank (Revolut at launch) operates without owning a core-banking system by:

- a Pretending to be a bank.
- b Renting capability from a licensed BaaS provider (e.g., Solaris, ClearBank) via API — the BaaS partner holds the banking licence, operates the core ledger, and rents out e-money / IBAN / payments capability while the neobank owns the customer experience and marketing.
- c Using only cash.
- d Using only crypto.

QP6.4 [Applied, MC] The CrowdStrike outage (July 2024) disrupted finance globally as:

- a A data breach.
- b A supply-chain concentration failure: a routine endpoint-security update bricked 8.5M Windows machines across airlines, banks, exchanges; highlights single-vendor cyber monoculture as systemic risk.
- c A ransomware attack.

Module 6: Infrastructure — Advanced Questions (Short Answer)

QA6.1 [Advanced, Short] “Cloud eliminates single points of failure.” In 2–3 sentences, state one way this is true (multi-AZ redundancy) and one way it is false (control-plane, IAM, or cloud-provider-global-event concentration — e.g., AWS us-east-1 2017, 2021).

QA6.2 [Advanced, MC] A digital-only bank stack for 1M customers minimally requires:

- a. A mobile app and a database.
- b. Core-banking ledger, real-time payments (FPS/SEPA/FedNow), KYC/AML + sanctions screening, card-issuing processor, fraud platform, mobile/web front-end, SRE + observability stack, regulatory-reporting pipeline, disaster-recovery.
- c. Only Kubernetes.
- d. Only a CRM.

QA6.3 [Advanced, Short] Do FedNow / SEPA Instant make retail CBDCs unnecessary? In 2–3 sentences, state *one* capability a CBDC has that an instant-payment rail does not (e.g., programmable money, offline payment, bearer-like privacy, central-bank-issued finality).

QA6.4 [Advanced, MC] AWS/Azure/GCP concentration in financial infrastructure:

- a. Is not a systemic risk.
- b. Is a live systemic-risk concern; regulators (DORA in EU, FSB, FFIEC in US) are drafting third-party critical-provider frameworks, and options include mandatory multi-cloud, regulated exit plans, and operational-resilience tests.
- c. Should be banned entirely.
- d. Is solved by private clouds.

enters application Jan 2025 in the EU, formalising critical-ICT-third-party oversight.

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Module 7: Compliance — Basic Questions (MC)

QB7.1 [Basic, MC] The three pillars of KYC are:

- a Privacy, speed, and cost.
- b Customer Identification (verify identity), Customer Due Diligence (understand purpose + risk rating), and ongoing monitoring (detect behavioural change, re-verify periodically).
- c Sales, marketing, and support.
- d Encryption, passwords, and firewalls.

QB7.2 [Basic, MC] Rule-based vs. risk-based AML monitoring:

- a Identical.
- b Rule-based fires on static thresholds (any transfer > \$10k) producing many false positives; risk-based scores each customer/transaction against peer behaviour, prior risk, and typology models — fewer but higher-quality alerts.
- c Rule-based is illegal.
- d Risk-based is illegal.

QB7.3 [Basic, MC] A Suspicious Activity Report (SAR) must be filed:

- a Only after a criminal conviction.
- b When an institution detects activity that *reasonably suggests* proceeds of crime, terrorism financing, or evasion; thresholds are typically within 30 days (US FinCEN), with continuing-SAR obligations for ongoing activity.
- c Only if the client is foreign.
- d Only at year end.

QB7.4 [Basic, MC] RegTech automates compliance by:

- a Replacing all regulators with software.
- b Applying NLP to regulatory texts, rules-engines to onboarding, ML to transaction-monitoring, graph analytics to beneficial-owner discovery, and workflow automation to SAR/STR pipelines — shifting human effort to edge cases.

Module 7: Compliance — Applied Questions

QP7.1 [Applied, Calc] A bank's AML system flags 500 transactions/day of which 495 are false positives. Compute (i) the false-positive rate of flagged alerts, (ii) if the bank handles 1M transactions/day with true base-rate prevalence 0.01%, what is the true-positive *recall* if the system also misses 2 genuine cases per day? Show the confusion-matrix arithmetic.

QP7.2 [Applied, MC] Compliance burden: traditional bank vs. DeFi protocol:

- a DeFi is more regulated.
- b A licensed bank has formal KYC/AML, SAR, capital, liquidity, conduct, and consumer-protection duties; a DeFi protocol has *fewer* statutory duties but also *fewer actual safeguards* — the user bears smart-contract, oracle, and depeg risks directly; the gap is the heart of the MiCA / SEC debate.
- c Both are identical.
- d Neither has any obligations.

QP7.3 [Applied, MC] MiCA (EU, in force 2024; stablecoins from June 2024, rest Dec 2024) classifies crypto-assets into:

- a A single category.
- b E-Money Tokens (EMTs — pegged to one fiat), Asset-Referenced Tokens (ARTs — basket-backed), and Other Crypto-Assets (utility + speculative); each tier has distinct prospectus, capital, and reserve requirements.
- c Only security tokens.
- d Only NFTs.

QP7.4 [Applied, MC] The Danske Bank Estonia case (\$230B suspicious) shows at least four compliance failures:

- a None.
- b Inadequate non-resident-portfolio CDD, weak transaction-monitoring thresholds, ignored internal-whistleblower escalations, and slow regulator cooperation — each a Module 7 failure mode.

Module 7: Compliance — Advanced Questions (Short Answer)

QA7.1 [Advanced, Short] The crypto Travel Rule (FATF Recommendation 16) undermines privacy claims. In 2–3 sentences, state the tension (pseudonymous-by-design vs. VASP-must-share-originator/beneficiary) and one technical mitigation (e.g., selective disclosure with zk-proofs, TRP protocols).

QA7.2 [Advanced, MC] A robust model-risk-governance framework for AI credit scoring includes:

- a) Only a single sign-off.
- b) Independent validation (separate team), documented model card, input-data lineage, fairness + drift monitors with alerting, retraining-trigger thresholds, human-override workflow for adverse decisions, incident-response playbook, and periodic independent audit.
- c) Only drift monitoring.
- d) Only a data lake.

QA7.3 [Advanced, Short] “Compliance by design” (rules embedded in smart contracts). In 2–3 sentences, state one case where it works (programmable transfer-restriction tokens under ERC-3643) and one where it fails (context-dependent judgement calls AML typologies require).

QA7.4 [Advanced, MC] US “regulation-by-enforcement” vs. EU MiCA proactive regulation:

- a) Both are identical.
- b) EU MiCA provides ex-ante clarity (licences, reserves, disclosure) — better for innovation planning but potentially over-inclusive; US enforcement produces case-by-case precedents — chilling innovation with uncertainty but letting regulators target specific harms; neither is strictly dominant.
- c) US is always better.
- d) EU is always better.

EU Travel Rule (TFR Art. 14) took effect Dec 2024, expanding originator/beneficiary data for crypto transfers.

Module 8: Future — Basic Questions (MC)

QB8.1 [Basic, MC] Self-Sovereign Identity (SSI) differs from traditional KYC in that:

- a SSI removes identity entirely.
- b SSI stores verifiable credentials in a user-controlled wallet and uses W3C DID/VC standards so the user presents minimum-disclosure proofs to verifiers, rather than each service storing its own copy of the raw identity data.
- c SSI is the same as a password manager.
- d SSI replaces passports.

QB8.2 [Basic, MC] Quantum computing threatens current crypto because:

- a Quantum computers are faster at everything.
- b Shor's algorithm on a sufficiently large fault-tolerant quantum computer breaks RSA and ECC (public-key) in polynomial time; symmetric crypto (AES) is affected only by \sqrt{N} Grover speedup and is mitigated by doubling key length.
- c Quantum breaks symmetric crypto only.
- d Quantum has no effect on crypto.

QB8.3 [Basic, MC] Climate finance instruments include:

- a Only carbon taxes.
- b Green bonds (ring-fenced use-of-proceeds), sustainability-linked loans (coupon tied to KPIs), voluntary and compliance carbon credits, and blended-finance vehicles (concessional capital de-risking private flows).
- c Only equities.
- d Only cash.

QB8.4 [Basic, MC] Digital technology can make green bonds more trustworthy via:

- a Nothing — digital does not help.
- b Tokenised use-of-proceeds with on-chain disbursement tracking, MRV (measurement-reporting-verification) oracles,

QP8.1 [Applied, MC] Post-quantum cryptography standardisation (NIST, finalised 2024) recommends:

- a Nothing specific.
- b ML-KEM (Kyber) for key establishment, ML-DSA (Dilithium) for digital signatures, and SLH-DSA (SPHINCS+) for stateless hash-based signatures; RSA/ECC remain vulnerable to future fault-tolerant quantum computers.
- c AES-128 with no other change.
- d Only classical RSA-4096.

QP8.2 [Applied, MC] Estonia e-Residency (government-issued) vs. blockchain SSI: the main tradeoff is:

- a Both are identical.
- b Estonia e-Residency offers strong legal recognition inside EU + seamless government services but centralises trust in the Estonian state; SSI (user-held wallets, DIDs/VCs) distributes trust and supports multi-issuer attestations but is young in regulatory recognition and interoperability.
- c SSI requires a physical ID card.
- d Estonia uses no ID.

QP8.3 [Applied, Calc] A carbon credit represents 1 tonne CO₂ offset at \$50. A company must offset 10,000 tonnes/year. Compute (i) annual cost, (ii) cost if tokenisation cuts intermediary markup from 30% to 5% — what is the saving per year assuming the \$50 price already includes the 30% markup (so the pre-markup cost is $\$50/1.30$)? Show the arithmetic.

QP8.4 [Applied, MC] The FTX collapse (Nov 2022) reveals regulatory gaps on:

- a None.
- b Lack of segregation between customer funds and Alameda trading book (no equivalent of broker-dealer customer-protection rule 15c3-3), absence of prudential capital + liquidity regulation on crypto-exchanges, opaque related-party lending, and offshore-entity jurisdiction arbitrage.

Module 8: Future — Advanced Questions (Short Answer)

QA8.1 [Advanced, Short] “Quantum will break Bitcoin in 10 years.” In 2–3 sentences, state the most pessimistic scenario (harvest-now-decrypt-later on dormant P2PK-exposed UTXOs; Shor attack on ECDSA once $\sim 2,000$ logical qubits achievable) and the most optimistic (IBM Heron / Google Willow at 2024–2025 show error-rates dropping but fault-tolerant at scale is \geq decade away; Bitcoin can soft-fork to PQC signatures).

QA8.2 [Advanced, MC] A cross-border financial-identity system that balances privacy, KYC, and portability needs:

- a A single database.
- b Decentralised identifiers (DIDs) + verifiable credentials (VCs) with selective-disclosure (zk-proofs), interoperable standards (W3C, EBSI), regulated issuer + verifier lists, revocation infrastructure, and legal-recognition agreements between jurisdictions.
- c Blockchain-only with no legal layer.
- d Government-only IDs with no privacy.

QA8.3 [Advanced, Short] Do ESG ratings + climate disclosures change corporate behaviour or are they “greenwashing with data”? In 2–3 sentences, cite *one* example that suggests real behaviour change (e.g., TCFD-driven divestment, SBTi emissions cuts) and one suggesting data-theatre (DWS \$19M SEC settlement 2023, EU Taxonomy gas+nuclear inclusion 2022).

QA8.4 [Advanced, MC] A BSc brief recommending a retail CBDC should cover:

- a Only technology choices.
- b Policy objective (financial inclusion? dollar-sovereignty? programmability?), design choices (token vs. account, direct vs. intermediated, tiered privacy), disintermediation risk on commercial banks, cyber + operational risk, legal tender status, and a phased pilot path (e.g., Sweden e-krona, ECB digital euro, Swiss Helvetia III).
- c Only the logo.
- d Only marketing copy.

96 questions complete.

- **Answer key:** see `exam_bank_solutions.pdf` (instructor copy).
- **Related materials:** `exam_prep_guide.pdf` (40-Q focused review); module summaries; glossary.
- **Remember:** This bank is *optional practice*. The graded assessment is Project 50% + Presentation 20% + Quizzes 30% (see syllabus).
- **Common misconceptions encoded in distractors:**
 - “Code is law” with no off-chain failure modes (QA3.1, QA3.4)
 - “VaR = worst loss” (QB4.1)
 - “DeFi eliminates all risk” (QA4.4)
 - “LLM hallucination is a bug to patch” (QP5.4)
 - “Cloud removes all concentration risk” (QA6.1, QA6.4)

you got $\geq 80\%$ correct across the 96 items, you are ready for the graded lesson quizzes.

If