

1.3 EXCHANGING DATA · 1.3.2

Transaction processing & ACID — Mark scheme

31 marks · spec 1.3.2(f)

AO key: AO1 = knowledge & understanding · AO2 = application · AO3 = reasoned judgements. Accept any valid alternative; do not award the same point twice.

Q	ANSWER	AO	MARKS
1(a)	A single logical operation on a database (1), often made of several steps that must all succeed or all fail (1). (2)	AO1	2
1(b)	Atomicity, Consistency, Isolation, Durability — 1 mark for two correct, 2 marks for all four. (2)	AO1	2

Q	ANSWER	AO	MARKS
2(a)	The transfer is all-or-nothing (1); both the subtraction from A and the addition to B happen, or neither does (1). (2)	AO2	2
2(b)	The database is left in a valid state (1); e.g. the total money is unchanged / rules are not broken (1). (2)	AO2	2
2(c)	The transaction is rolled back (1); the money is returned to A so the database is as if the transfer never happened (1). (2)	AO2	2

Q	ANSWER	AO	MARKS
3(a)	Once committed, the transaction's changes are permanent (1) and survive a later crash / power loss (1). (2)	AO1	2
3(b)	Write the committed changes to non-volatile storage / a transaction log. (1)	AO1	1
3(c)	Isolation. (1)	AO1	1

Q	ANSWER	AO	MARKS
4(a)	1 mark per point, max 3: - the first transaction locks the seat record while it changes it (1) - the second transaction must wait until the lock is released (1) - so the two cannot change the same record at once / each runs as if alone (1)	AO2	3
4(b)	Both could read "1 seat free" and both book it (a lost update) (1), so the seat is double-booked / overbooked (1). (2)	AO2	2
4(c)	Any one: it can slow the system (waiting) / it can cause a deadlock. (1)	AO1	1

Q	LEVELS-OF-RESPONSE MARK SCHEME	AO	MARKS										
5(a)	Mark using the levels descriptors below. AO1 (knowledge of ACID), AO2 (application to the shop).	AO1 ×4 AO2 ×4	8										
	<table><tr><th>LEVEL</th><th>DESCRIPTOR</th></tr><tr><td>Level 3 (6–8)</td><td>Explains all four ACID properties accurately and clearly applies them to the shop processing many orders with possible failures. Well structured.</td></tr><tr><td>Level 2 (3–5)</td><td>Explains most properties with some application to the context.</td></tr><tr><td>Level 1 (1–2)</td><td>Basic points about one or two properties with little application.</td></tr><tr><td>0</td><td>Nothing creditworthy.</td></tr></table>			LEVEL	DESCRIPTOR	Level 3 (6–8)	Explains all four ACID properties accurately and clearly applies them to the shop processing many orders with possible failures. Well structured.	Level 2 (3–5)	Explains most properties with some application to the context.	Level 1 (1–2)	Basic points about one or two properties with little application.	0	Nothing creditworthy.
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Indicative content (credit any valid point): • Atomicity: an order (take payment + reduce stock) is all-or-nothing; if payment fails, stock is not reduced (rollback). • Consistency: stock levels and balances stay valid (e.g. stock never negative). • Isolation: simultaneous orders for the same item don't interfere, so stock isn't over-sold. • Durability: once an order is committed, it survives a crash because it is written to non-volatile storage / a log.													
5(b)	Record locking stops two orders changing the same stock record at once (isolation / no lost update) (1+1) ; drawback: it can slow processing or cause deadlock (1) . (3)	AO2	3										

Total for paper: 31 marks