23COA220 Mathematics for Computer Science (F312908) − 53 (53/100)

1a (0/3)

- Missing/wrong (0)

1b (0/2)

- Missing/wrong/no justification (0)

1c (1/1)

- Correct: $-3 + 2 - 4 = -5$ (1)

1d (2/2)

- Correct: $det\left(\begin{bmatrix} -1 & 2 \\ -2 & 1 \end{bmatrix}\right) = (-1) - 2 \times (-2) = 3$ (2)

1e (6/6)

- Correct: $x = 2, y = 0, z = 2$ (6)

1f (4/6)

- correctly found $B = \begin{bmatrix} -1 & 2 & 2 \\ 3 & 1 & -2 \\ 7 & 4 & -3 \end{bmatrix}$ (1)
- partial result (analytical solution): correct formula for finding inverse:

$$B^{-1} = \frac{1}{\det B} C_{ij}^T.$$

  (1)
- partial result (analytical solution): correctly found matrix of minors (missing minuses, possibly): $\begin{bmatrix} \left|\begin{smallmatrix} 1 & -2 \\ 4 & -3 \end{smallmatrix}\right| & -\left|\begin{smallmatrix} 2 & 2 \\ 4 & -3 \end{smallmatrix}\right| & \left|\begin{smallmatrix} 2 & 2 \\ 1 & -2 \end{smallmatrix}\right| \\ -\left|\begin{smallmatrix} 3 & -2 \\ 7 & -3 \end{smallmatrix}\right| & \left|\begin{smallmatrix} -1 & 2 \\ 7 & -3 \end{smallmatrix}\right| & -\left|\begin{smallmatrix} -1 & 2 \\ 3 & -2 \end{smallmatrix}\right| \\ \left|\begin{smallmatrix} 3 & 1 \\ 7 & 4 \end{smallmatrix}\right| & -\left|\begin{smallmatrix} -1 & 2 \\ 7 & 4 \end{smallmatrix}\right| & \left|\begin{smallmatrix} -1 & 2 \\ 3 & 1 \end{smallmatrix}\right| \end{bmatrix}$ (1)
- partial result (analytical solution): Every minor was multiplied with $(-1)^{row+column}$ (1)
- partial result (analytical solution): got to the final multiplication leading to C, which shows understanding: $det(C) = 8$ (0)

2a (2/6)

- partial results (if group definition correct): (group) definition correct (1)
- partial results (if group definition correct): gave formula for associativity (be it via example), and/or claimed it true from Cayley table (0.5)
- partial results (if group definition correct): gave formula for commutativity (be it via example), or claimed it true from Cayley table (without explanation) (0.5)

2b (1/4)

- partial result: definition of monoid correct (1)

2c (1/2)

- partial result (not subset, group and operation the same): correctly identified subset or operation of each other (1)

2d (2.5/3)

- partial result: definition of closure correct (0.5)
- partial result: proved correctly that not associative (2)

Comment: I gave marks for associativity assuming a typo is the computation there

2e (0/5)

- Missing/wrong (0)

3a (2/3)

- partial results: correctly add 1 to $\sum$ (1)
- partial results: correctly do product of parenthesis (1)

3b (1/4)

- correct partial answers: correct answers, but missing/wrong arguments (1)

3c (0/4)

- Missing/wrong (0)

3d (0/4)

- Missing/wrong (0)

3e (0.5/5)

- partial steps: Base case stated correctly (1)
- wrong partial steps: base case not for $n = 1$ (-0.5)

4a (2/2)

- Correct $p = \frac{1}{11}$ (2)

4b (0/2)

- Missing/wrong (0)

4c (2/3)

- Correct answer should be $\binom{8+6-1}{6} = 1716$: wrongly answered $\binom{8+6-1}{8}$ (mixed balls and urns) (2)

4d (3/3)

- Correct $\left(\frac{1}{11}\right)^6$ (3)

4e (2.5/5)

- partial answers: amount of possibilities are missing completely (namely, 7^k) (2.5)

4f (5/5)

- Correct $\binom{6}{4}\left(\frac{1}{11}\right)^4\left(\frac{10}{11}\right)^2 = \frac{6\times5\times10^2}{2\times11^6} = \frac{1500}{11^6}$ (but answer might be using wrong probabilities from

a.) (5)

5a (6.5/10)

- mean: $\bar{X} = \frac{1\times0+5\times1+1\times2+3\times3+2\times4}{1+5+1+3+2} = \frac{24}{12} = 2$ (2)
- mode: $X = 1$ appears 5 times (2)
- median: found correct position 6.5 but did not do average of elements on positions 6 and 7 (1)
- variance: elements/differences in variance should be multiplied by frequency (1)
- degrees of freedom: Answer is wrongly 4 (frequencies only considered here) (0.5)

5b (5/6)

- (slightly) wrong answers: subtracted values instead of adding them (5)

5c (4/4)

- Correct $[82-5.16, 82+5.16] = [76.84, 87.16]$ (4)

6 (0/0)

- None (0)