

# Midterm, Quantitative Analysis F, QM2103, May 20, 2021

You have 90 minutes. No retakes. Best of Luck. Be honest to Allah and yourself.

\* This form will record your name, please fill your name.

1. A plant manager considers the operational cost per hour of five machine alternatives. The cost per hour is sensitive to three potential weather conditions: cold, mild, and warm. The following table represents the operations cost per hour for each alternative-state of nature combination:

States of Nature			
Weather related cost per hour			
Alternatives	Cold cost/day	Mild cost/day	Warm cost/day
Machine 1	28	38	36
Machine 2	42	33	39
Machine 3	32	39	38
Machine 4	29	33	34
Machine 5	37	40	38

Assume that for a randomly selected day, there is a 35% probability of cold weather, 45% probability of mild weather, and 20% probability of warm weather. What is the EVPI?

(5 Points)

- ☐ A) 0.35
- ☐ B) 31.8
- ☐ C) 31.45
- ☐ D) 5.8
- ☐ E) None

2. One MAD is equivalent to approximately  
(1 Point)

- ☐ A) 0.8.
- ☐ B) 1.2.
- ☐ C) 2.0.
- ☐ D) 1.6.

3. Which of the following methods produces a particularly stiff penalty in periods with large forecast errors?

(2 Points)

- ☐ A) MAD
- ☐ B) MAPE
- ☐ C) MSE
- ☐ D) Decomposition
- ☐ E) All give equal penalty

4. A measurable quantity that may vary, or is subject to change, and can be controlled is known as a(n)

(1 Point)

- ☐ A) decision variable.
- ☐ B) parameter.
- ☐ C) solution.
- ☐ D) algorithm.

5. The following is a payoff table giving costs for various situations.

	State 1	State 2	State 3
Alternative 1	58	94	85
Alternative 2	79	62	75
Alternative 3	48	72	102
Alternative 4	62	45	74

What decision would an optimist make?  
(3 Points)

- ☐ A) Alternative 1
- ☐ B) Alternative 2
- ☐ C) Alternative 3
- ☐ D) Alternative 4

6. The following is a payoff table giving profits for various situations.

	State 1	State 2	State 3
Probability	0.38	0.32	0.3
Alternative 1	254	348	287
Alternative 2	265	322	287
Alternative 3	324	302	298
Alternative 4	348	298	302

What is the expected value with perfect information?  
(4 Points)

- ☐ A) 16
- ☐ B) 318.2
- ☐ C) 348
- ☐ D) 334.2
- ☐ E) None

7. Last week's humidity levels in the city of Islamabad have been: 93, 94, 93, 95, 92, 86, 98. Calculate the MAD based on a two-day moving average, covering all days in which you can have a forecast and an actual humidity level.  
(2 Points)

- ☐ A) 4.3
- ☐ B) 3.9
- ☐ C) 4.5
- ☐ D) 4.1
- ☐ E) None

8. Carry out the Classical Time Series Decomposition for the quarterly data given. USE MAPE FOR THE BEST MODEL SELECTION CRITERION FOR ALL MODELS. USE GRG NONLINEAR METHOD IN EXCEL SOLVER FOR ALL MODELS, EXCEPT MA. USE THE BEST OF EITHER 2 OR 3 PERIOD MOVING AVERAGE FOR MA MODEL ONLY. USE AN INCREMENT OF 0.000001 (AND MAXIMUM WEIGHT OF 10 FOR WMA), FOR ALL MODELS, EXCEPT MA, IN SOLVER. Find out the forecast for 17th period and the forecast error (use two decimal points).

Year	Q1	Q2	Q3	Q4
1	8974		7854	10012
2	8834		8001	9924
3	7982		7777	10542
4	8547		8100	9875
5	8666		7564	9990

The forecast value for period 17 and the forecast error are:  
(20 Points)

- ☐ A) 9875, -1.23%
- ☐ B) 11106, 1.78%
- ☐ C) 10789, 0.63%
- ☐ D) 10045, -0.55%
- ☐ E) None

9. The following is a payoff table giving profits for various situations.

States of Nature			
Alternatives	A	B	C
Alternative 1	1100	1220	1850
Alternative 2	2000	1500	250
Alternative 3	1320	1440	1280
Do Nothing	0	0	0

The probabilities for states of nature A, B, and C are 0.3, 0.5, and 0.2, respectively. If a perfect forecast of the future were available, what is the expected value of perfect information (EVPI)?

(4 Points)

- ☐ A) 1400
- ☐ B) 320
- ☐ C) 1720
- ☐ D) 360
- ☐ E) None

10. KJ built his taco truck out of \$75,000,000 worth of titanium and duct tape. He uses \$5.25 of ground beef, \$2.25 of cheese, and \$1.50 of lettuce in each taco. If he sells tacos at \$10 each, what is his break-even quantity?

(3 Points)

- ☐ A) 1,250,000
- ☐ B) 750,000,000
- ☐ C) 75,000,000
- ☐ D) 15,000,000
- ☐ E) None

11.

The break-even point of a simple profit model represents a(n)  
(1 Point)

- ☐ A) parameter.
- ☐ B) decision variable.
- ☐ C) uncontrollable variable.
- ☐ D) constant.

12. The following is a payoff table giving profits for various situations.

	State 1	State 2	State 3
Probability	0.4	0.35	0.25
Alternative 1	111	137	143
Alternative 2	123	142	138
Alternative 3	126	132	147
Alternative 4	144	145	139

If a person were to use the expected monetary value criterion, what decision would be made?

(3 Points)

- ☐ A) Alternative 1
- ☐ B) Alternative 2
- ☐ C) Alternative 3
- ☐ D) Alternative 4

13. The following data represents the values of Stock Index.

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Stock index 1	11357.51	10997.93	11122.65	11253.26	11522.56	11572.20	11511.08	11551.10	11582.43	11722.98	11560.72	11489.36	11351.30	11251.71	11008.17
Stock index 2	2736.39	2882.18	2913.86	2887.87	3027.50	2906.75	3024.82	3043.60	3016.77	3069.10	2894.68	3168.83	3223.40	3267.70	3235.50

Which Stock index can be better modeled using simple linear regression, what is the value of R Square (Coefficient of Determination) for this model? Nearest value using four decimal points.

(8 Points)

- ☐ A) Stock 1, 0.4568
- ☐ B) Stock 1, 0.8216
- ☐ C) Stock 2, 0.6214
- ☐ D) Stock 2, 0.7606
- ☐ E) None



14. Consider the actual and forecast values contained in the table.

#	1	2	3	4	5	6	7	8
Y	28	42	49	74	78	93	115	129
Forecast	25.667		40.047		54.429		68.809	83.19
							97.571	111.952
								126.333

Use exponential smoothing with best value of  $\alpha$  (use increment of 0.000001) using Excel solver and GRG Nonlinear method? What is the MAPE and at which observation is the tracking signal at its minimum value?

(5 Points)

- ☐ A) 6.12%, #8
- ☐ B) 6.02%, #1
- ☐ C) 6.22%, #4
- ☐ D) 5.92%, #6
- ☐ E) None

15. Which Excel feature allows the user to specify a target or goal and the variable that is desired to change in order to achieve that goal?

(2 Points)

- ☐ A) Goal Search
- ☐ B) Solver
- ☐ C) Goal Seek
- ☐ D) Target Search

16. When is the exponential smoothing model equivalent to the naïve forecasting model?  
(2 Points)

- ☐ A)  $\alpha = 0.5$
- ☐ B)  $\alpha = 1$
- ☐ C) never
- ☐ D)  $\alpha = 0$

17. Demand for Y is shown in the table.

Period	1	2	3	4	5	6	7	8	9	10	11	12
Y	44	52	48	39	49	52	54	63	59	61	58	59

Develop a forecast using a trend line. What is the forecast for period 14? Round to two decimal points.

(4 Points)

- ☐ A) 65.07
- ☐ B) 63.48
- ☐ C) 42.85
- ☐ D) 59.87
- ☐ E) None

18. KJ built his taco truck out of \$75,000,000 worth of titanium and duct tape. He uses \$2.25 of ground beef, \$0.75 of cheese, and \$0.25 of lettuce in each taco. If he sells tacos at \$10 each, what is his break-even quantity?  
(3 Points)

- ☐ A) 40,000,000
- ☐ B) 22,222,222
- ☐ C) 11,111,111
- ☐ D) 400,000
- ☐ E) None

19. An analytic and systematic approach to the study of decision making is referred to as  
(2 Points)

- ☐ A) decision analysis.
- ☐ B) decision making under risk.
- ☐ C) decision theory.
- ☐ D) decision making under uncertainty.

20. The following is a payoff table giving costs for various situations.

	State 1	State 2	State 3
Probability	0.28	0.38	0.34
Alternative 1	22	26	34
Alternative 2	32	29	34
Alternative 3	35	29	30
Alternative 4	28	31	37

If a person selected Alternative 3, what would the expected cost be?  
(3 Points)

- ☐ A) 26.24
- ☐ B) 27.6
- ☐ C) 31.02
- ☐ D) 34
- ☐ E) None

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