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CSE471 Enrol. No. A02311983 20027

[ET]

END SEMESTER EXAMINATION : NOVEMBER-DECEMBER, 2023

TIME SERIES ANALYSIS FOR AI

Time : 3 Hrs. *Maximum Marks : 60*

Note: ***Attempt questions from all sections as directed. Use of scientific calculator is allowed.***

SECTION – A (24 Marks)

Attempt any **four** *questions out of* **five.**
Each question carries **06** *marks.*

1. Discuss the decomposition process for time series analysis.

2. How can you deal with non-stationarity in time series data when using the Auto correlation function (ACF) and Partial Auto correlation function (PACF).

P.T.O.

3. (a) What are the limitations of linear regression for forecasting? (3)

(b) What are some alternative forecasting methods that can be used when linear regression is not appropriate? (3)

4. Explain Feature Selection using the Information Gain/ Entropy Technique for building a Decision Tree.

5. The Demand and Forecast of an item for five months are given in the following table:

Period	Actual Demand (D_i)	Forecasted Demand (F_i)
April	225	200
May	220	240

June	285	300
July	290	270
August	250	230

Calculate Mean Absolute Deviation (MAD), Mean Absolute Percent Error (MAPE), Mean squared error (MSE).

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three.**

Each question carries **10** *marks.*

6. (a) What is the augmented Dickey-Fuller test?

(5)

(b) How can you interpret the results of the augmented Dickey-Fuller test? (5)

7. We will use the dataset below to learn a decision tree which predicts if people pass machine learning (Yes or No), based on their previous GPA (High, Medium, or Low) and whether or not they studied.

GPA	Studied	Passed
L	F	F
L	T	T
M	F	F
M	T	T
H	F	T
H	T	T

For this problem, you can write answers using $\log_2$, but it may be helpful to note that $\log_2 3 \sim 1.6$.

(a) What is the entropy H(Passed)? (2)

(b) What is the entropy H(Passed | GPA)? (4)

(c) What is the entropy H(Passed | Studied)? (4)

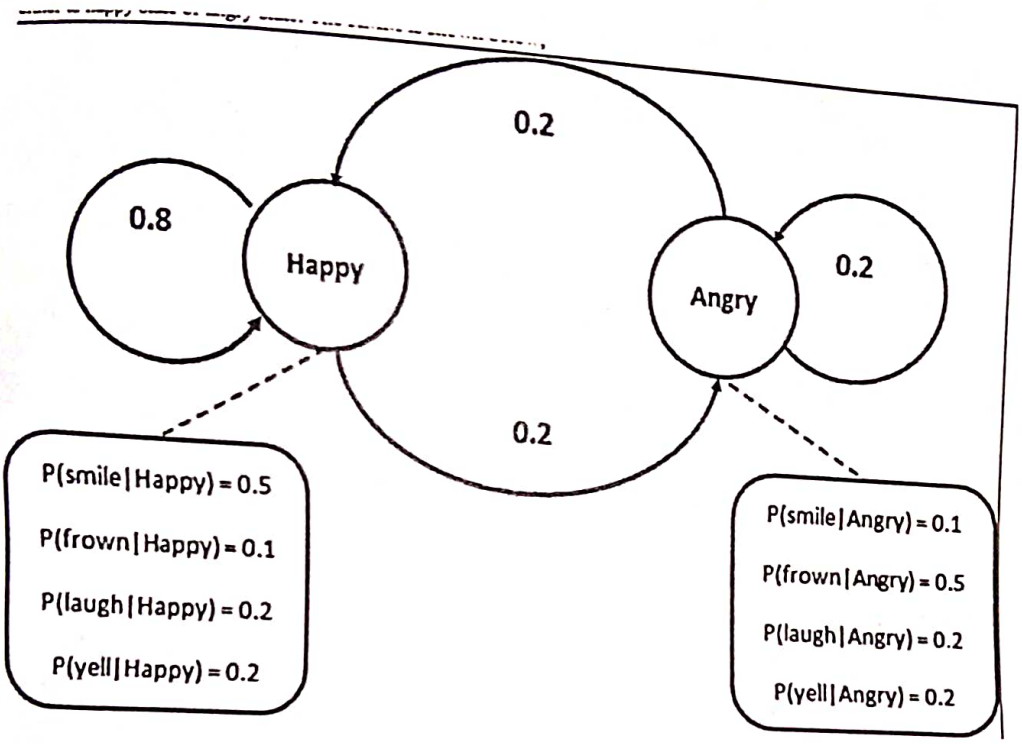
8. (a) Assume that the number of periods is 4, and we want a weighted moving average of four stock prices of $70, $66, $68, and $69, with the first price being the most recent.Using the information given, the most recent weighting will be 4/10, the previous period before that will be 3/10, and the next period before that will be 2/10, and the initial period weighting will be 1/10 (6)

(b) Discuss the applications of Time series analysis in the field of Finance and healthcare. (4)

SECTION – C (16 Marks)

(Compulsory)

9. Mr. X is happy someday and angry on other days. We can only observe when he smiles, frowns, laughs, or yells but not his actual emotional state. Let us start on day I in the happy state. There can be only one state transition per day. It can be either to happy state or angry state. The HMM is shown below;



Assume that qt is the state on day t and ot is the observation on day t. Answer the following questions;

(a) What is $P(q_2 = Happy)$? (3)

(b) What is $P(o_2 = frown)$? (3)

(c) What is $P(q_2 = Happy \mid o_2 = frown)$? (4)

(d) What is $P(o_1 = frown\ o_2 = frown\ o_3 = frown\ o_4 = frown\ o_5 = frown,$

q_1 = *Happy* q_2 = *Angry* q_3 = *Angry* q_4 = *Angry* q_5 = *Angry)* if π = *[0.7, 0.3]*? (6)