

Roll No: -----



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: M-Tech

Semester – III

Subject (Course): System Identification Methods

Max. Marks :100

Course Code : MAEG811

Duration : 3 Hrs

No. of page/s:

Note: Make use of *sketches/plots* to elaborate your answer. Brief and to the point answers are expected. The Question Paper contain 3 Sections- Section A, B and C

Section A (10 X 2M=20M)

1. What are objectives of FPR?
2. Labelled the scale factor, time delay and bias factor on the same sketch.
3. Write effect of smoothing on data collected through testing of an aircraft.
4. Explain Open loop and closed loop control system.
5. What is Data Acquisition System?
6. Name any FOUR Filtering processes.
7. Write methods used for parameter Estimation of UAV.
8. Which inputs are used for longitudinal and lateral-directional system Identification?
9. Define Data Compatibility.
10. Write two applications of ML Method.

Section B (4 X 10M=40M)

11. Classify types of Errors and briefly write a note on Aircraft Instrumentation Errors.
12. Explain and Draw the curves defining Longitudinal aerodynamic characteristics (δ_e , q , V , θ , a_x and a_z) w.r.t time.
13. Write difference between Maximum Likelihood Method, Kalman filter and UnExtended Kalman filter.
14. Explain any four techniques used for optimization of cost function.

Section C (2 X 20M=40M)

15. Write suitable Matlab code for defining observation and state Equations if aircraft is moving about lateral-directional motion with some translational velocity
16. Generate Mathematical Modelling for an aircraft, which is moving with Translational motion and rotational motion. Assume steady conditions.

OR

- (a) What is Flight path Reconstruction? Write its objectives and explain briefly with suitable sketches of reconstructed and measured variables [10M]
- (b) What is Aircraft system Identification? Explain each component of Aircraft system Identification with help of Block Diagram [10M]

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Section A (10 X 2M=20M)

1. Define Hessian Matrix.
2. Write principle of Maximum Likelihood Method.
3. Define Fischer Information Matrix.
4. Write two properties of ML Estimates.
5. Define cost function.
6. Write methods used for parameter Estimation of aircraft.
7. Define Filtering processes.
8. Draw data compatibility using curve.
9. Which inputs are used for longitudinal and lateral-directional system Identification.
10. What do you understand by term System Identification

Section B (4 X 10M=40M)

11. Derive Rotational Kinematic Equation in terms of Euler's angle.
12. Enumerate observation and state equations for lateral directional motion of an aircraft.
13. Explain types of sensors used in aircraft and Write brief note on Data Acquisition System.
14. Explain techniques used for optimization Methods.

Section C (2 X 20M=40M)

15. What is Mathematical Modelling? Write steps used to generate mathematical model for an aircraft. Mention Translational, Rotational, force & Moment Equations to generate mathematical model.
16. Generate a Matlab code for defining observation and state Equation of an aircraft which is having six degrees of freedom.

OR

- a. Explain term “system Identification”. Why it is used for designing controls or auto-pilot generation? Illustrate it by suitable sketches. [10M]
- b. Draw curves defining Longitudinal aerodynamic characteristics (δ_e , q , V , θ , a_x and a_z) w.r.t time and what are the factors which affect these characteristics if model is non-linear. [10M]