

Name:	
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: System Identification Methods (AVEG8002) **Semester: III**
Programme: M-Tech ASE (UAV)

Time: 03 hrs. **Max. Marks: 100**

Instructions: Make use of sketches/plots to elaborate your answer. The Question Paper contain 3 Sections- Section A, B and C

SECTION A (5 x 4 = 20 Marks)

S. No.	Question	Marks	CO
Q 1	Which stability & control derivatives are used for longitudinal and lateral-directional system Identification? Write its significance in parameter estimation.	5	CO3
Q 2.	Labelled & define scale factor, time delay and bias factor on the same sketch.	5	CO3
Q 3.	Define Estimators and enumerate properties of Estimators.	5	CO1
Q 4.	Differentiate Open loop and closed loop control system.	5	CO4

SECTION B (10 x 4 = 40 Marks)

Q 5.	Classify types of Errors and briefly write a note on Aircraft Instrumentation Errors.	10	CO3
Q 6.	<p>Explain any “four” techniques used for optimization of cost function to estimate parameters of an aircraft.</p> <p style="text-align: center;">OR</p> <p>Derive $J(\Theta, R) = L(z \Theta, R) = \frac{1}{2} \sum_{k=1}^N \left[[z(tk) - y(tk)] \right]^R z(tk) - y(tk)$</p> <p>Deduce principle & properties of Maximum Likelihood Estimation.</p>	10	CO4
Q 7.	Explain and Draw the curves defining Longitudinal aerodynamic characteristics (δ_e , q, V, θ, a_x and a_z) w.r.t time.	10	CO2
Q 8.	Define Bayesian Model, fischer model, least square model and properties of Bayesian, fischer and least square model.	10	CO1

SECTION-C(20 x 2 = 40 Marks)

Q 9.	<p>Generate Mathematical Modelling for an aircraft, which is moving with Translational motion and rotational motion. Assume steady conditions.</p> <p style="text-align: center;">OR</p> <p>Write suitable Matlab code for defining observation and state Equations if aircraft is moving about lateral-directional motion with some translational velocity</p>	20	CO3
10.	<p>(a) What is Flight path Reconstruction? Write its objectives and explain briefly with suitable sketches of reconstructed and measured variables [10M]</p> <p>(b) What is Aircraft system Identification? Explain each component of Aircraft system Identification with help of Block Diagram [10M]</p>	20	CO2

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SECTION A (5 x 4 = 20 Marks)

S. No.		Marks	CO
Q 1	Define Estimators and enumerate properties of Estimators.	5	CO1
Q 2.	Differentiate Kalman filter and UnExtended Kalman filtering Techniques.	5	CO3
Q 3.	Define Smoothing. Write its effect on data collected through testing of an aircraft.	5	CO3
Q 4.	Name any FOUR Filtering processes and explain any “ONE”.	5	CO4

SECTION B(10 x 4 = 40 Marks)

Q 5.	Draw curves defining Longitudinal aerodynamic characteristics (elevator deflection(δ_e , q , V , θ , a_x and a_z)w.r.t time	10	CO3
Q 6.	Explain any “four” techniques used for optimization of cost function to estimate parameters of an aircraft.	10	CO1
Q 7.	Derive fisher information in terms of gradient vector and the parameter vector change $F \Delta \Theta = G$ OR Define Maximum likelihood Method. Enumerate principle & properties of Maximum Likelihood.	10	CO2
Q 8.	Explain Estimation theory for linear and non- linear models. Determine output and measurement equation for linear and non-linear models.	10	CO4

SECTION-C(20 x 2 = 40 Marks)

Q 9.	<p>Generate Mathematical Modelling for a point mass, which is moving with Translational motion and rotational motion. Assume steady conditions.</p> <p style="text-align: center;">OR</p> <p>Write suitable Matlab code for defining observation and state Equations if aircraft is moving about longitudinal motion with some translational velocity.</p>	20	CO3
Q 10.	<p>(a) What is Flight path Reconstruction? Write its objectives and explain briefly with suitable sketches of reconstructed and measured variables [10M]</p> <p>(b) What is Aircraft system Identification? Explain each component of Aircraft system Identification with help of Block Diagram [10M]</p>	20	CO2