

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2022

Course: Avionics System Design

Program: ASE+AVE

Course Code: AVEG 4007

Semester: VIII

Time : 03 hrs.

Max. Marks: 100

Instructions:

**SECTION A
(5Qx4M=20Marks)**

S. No.		Marks	CO
Q 1	Discuss the term Autopilot and its types	4	CO1
Q 2	What are generalized error coefficients?	4	CO2
Q 3	Define positional constant	4	CO3
Q 4	List the time domain specifications.	4	CO4
Q 5	Sketch the response of a second order under damped system.	4	CO4

**SECTION B
(4Qx10M= 40 Marks)**

Q 6	For the system with following transfer function , determine type and order of the system $(1) G(s)H(s) = \frac{K}{s(s+1)(s^2+6s+8)} \quad (2) G(s)H(s) = \frac{20(s+2)}{s^2(s+3)(s+0.5)}$ $(3) G(s)H(s) = \frac{(s+4)}{(s-2)(s+0.25)} \quad (4) G(s)H(s) = \frac{10}{s^3(s^2+2s+1)}$	10	CO2
Q 7	A unity feedback system has a open loop transfer function of $G(s) = \frac{10}{(s+1)(s+2)}$. Determine the steady state error for unit step input.	10	CO3
Q 8	The characteristic polynomial of the system is , $s^7 + 9s^6 + 24s^5 + 24s^4 + 24s^3 + 24s^2 + 23s + 15 = 0$, Determine the location of the roots on s- plane and hence the stability of the system.	10	CO 4
Q 9	The characteristic polynomial of the system is , $s^7 + 9s^6 + 24s^5 + 24s^4 + 24s^3 + 24s^2 + 23s + 15 = 0$, Determine the location of the roots on s- plane and hence the stability of the system.	10	CO4

**SECTION-C
(2Qx20M=40 Marks)**

Q 10	Construct the routh array and determine the stability of the system whose characteristic equation is $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 +$	20	CO1
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	$16s + 16 = 0$. Also determine the no of roots lying on the left half of the s-plane, right half of the s- plane, on the imaginary axis.		
Q 11	<p>Describe each blocks mentioned in the Figure below</p> <pre> graph TD AS[AVIONIC SYSTEM] --> N[To allow NAVIGATE] AS --> FB[To control FLIGHT behaviour] AS --> WS[To survey WHEATHER situation] AS --> C[To allow COMMUNI-CATE] AS --> M[To manage and control On Board Systems] FB --> DA[Data Acquisition] FB --> DE[Data Elaboration] FB --> DO[Data Output] DA --> P["-pitch angle θ"] DA --> R["-roll angle δ"] DA --> A["Attack Angle α"] DA --> IAS["IAS-Indicated Air Speed"] DA --> FA["Flight Altitude \"z\""] DE --> V["Vertical Speed \"Vz\""] DO --> CREW["To the CREW"] DO --> OS["To other Systems"] </pre>	20	CO 3