UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April, 2017

Program Name: B.Tech ASE+AVE   Semester –   VIII
Course Name : Avionics System Design   Max. Marks   : 100
Course Code : ASEG 421   Duration   : 3 Hrs
No. of page/s: 02

Section – A (4x5=20 Marks)

1. Explain about the centralized fault display system of Civil Aircraft.
2. What are the major factors to be considered to design the HMD of Military Aircraft?
3. List out the advantages of Electro optic system for FBL
4. What are the RTCA DO-160 Tests Required for digital avionics

Section – B (4 x 10 = 40 Marks)

5. Draw and explain the power supply design for **MIL-STD-704** applies to Military Aircraft
   a)   MIL-STD-704E 115V,400Hz ac
   b)   MIL-STD-704E 28V,dc

6. Write the MATLAB programming for vanguard missile control system
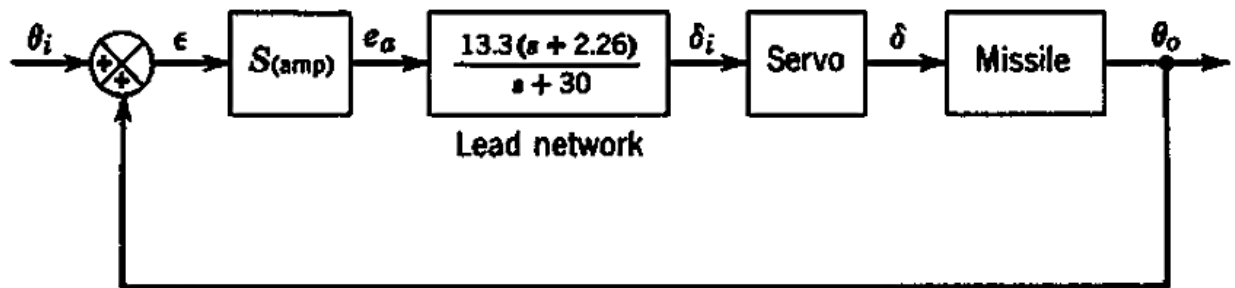
Vanguard control system (rigid missile)

$$\text{TF (servo)} = \frac{2750}{(S^2 + 84S + 2750)}; \qquad \text{TF (Missile)} = \frac{-7.21}{(S+1.6)(s-1.48)}$$

7. Explain the LRU package for civil aircraft and military aircraft
   a) ARINC 600 LRU standard
   b) DOD-STD-1788 LRU standard

8. Explain the following:
   a) Resonant peak & Resonant frequency
   b) Bandwidth
   c) Cut-off rate
   d) Gain margin
   e) Phase margin

   (Or)

9. A unity feedback system has

   $$G(s) = \frac{1}{s(1+s)}$$

   The input to the system is described by $r(t) = 4 + 6t + 2t^3$. Find the
   i)   Generalized error coefficients and hence
   ii)   Steady-State error

   ## Section-C (2 x 20 = 40 Marks

10. Draw and explain the Pitch Rate Feedback for Longitudinal Autopilot also Explain the Effects of Gyro Sensitivity

   $$S_{rg} = 1.19 \; \frac{volt}{deg/sec} \; , \qquad\qquad S_{rg} = 1.98 \frac{volt}{deg/sec}.$$

11. Construct the Bode plot for the system having

   $$G(s) = \frac{10}{s(1 + 0.4s)(1 + 0.1s)}$$

   From the Bode plot determine

   a) Gain and phase crossover frequencies
   b) Gain and phase Margin
   c) Comments on the stability of the system
          (Or)

12. Explain the following:
   a) Cathode ray oscilloscope (CRT-Monochrome, Color)
   b) Wash-out circuit
   c) Flight Management system
   d) Displacement Autopilot
   e) HUD

Name of Examination (Please tick, symbol is given)	:	MID		END	✔	SUPPLE	
Name of the College (Please tick, symbol is given)	:	COES	✔	CMES		COLS	
Program/Course	:	B. Tech / ASE+AVE					
Semester	:	VIII					
Name of the Subject	:	Avionics System Design					
Subject Code	:	AVEG 421					
Name of Question Paper Setter	:	RAJA M					
Employee Code	:	40000908					
Mobile & Extension	:	8938817363					

Note: Please mention additional Stationery to be provided, during examination such as Table/Graph Sheet etc. else mention "NOT APPLICABLE":
1. **Graph Sheets**
2. **Semi log Sheets**

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Date of Examination	:	
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Note: - Pl. start your question paper from next page

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Section – A (4x5=20 Marks)

1. What is PID controller and what is its effect on system performance?

2. Differentiate Displacement conventional transport aircraft Vs. Jet aircraft

3. What are the RTCA DO-160 Tests Required for digital avionics

4. Draw and explain the Fly-By-Light flight system

Section – B (4 x 10 = 40 Marks)

5. Design the lateral autopilot for damping of the Dutch roll
   Transfer function for Aircraft $= \frac{-1.38(S^2+0.05S+0.066)}{(s-0.004)(S^2+0.38S+1.813)}$; $Servo\ t/f = \frac{s}{(S+10)}$,Yaw rate gyro sensitivity 1.04; wash out filter time constant 3 sec and 0.5 sec comments the condition for stability.

6. Explain about the Military and Civil Requirements and Tips for Power System Design

7. Using Routh's stability criterion determine the range of K for which the system will remain stable

$$\frac{C(s)}{R(s)} = \frac{K}{s(s^2+s+1)(s+2)+K}$$

8. Design the pitch orientation autopilot for stable and unstable condition

   (Or)

9. Explain the following:
   a) Resonant peak & Resonant frequency
   b) Bandwidth
   c) Cut-off rate
   d) Gain margin
   e) Phase margin
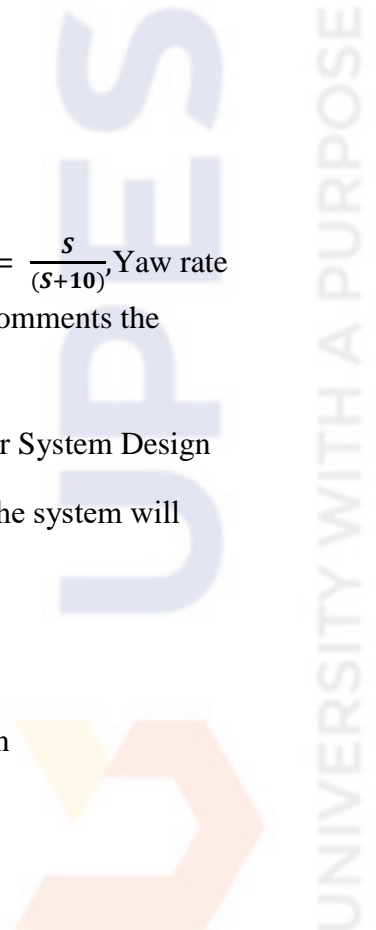
10. For unity feedback system having open-loop transfer function as

$$G(s) = \frac{K(s+2)}{s^2 \, (s^2+7s+12)}$$

Determine

       i)   Type and order of the system
      ii)   Error constant
     iii)   Steady-state error for parabolic input

11. Construct the Bode plot for the system having

$$G(s) = \frac{80}{s(s+2)(s+20)}$$

From the Bode plot determine

a) Gain and phase crossover frequencies
b) Gain and phase Margin
c) Comments on the stability of the system

(Or)

12. Explain the following:
      a) Helmet mounted display
      b) Night vision goggles (NVG) Vs. Forward looking Infrared (FLIR)
      c) Pitch rate feedback
      d) Gyro sensitivity
      e) Angle of departure and Breakaway point