Hall Ticket No: | | | | | | | | | | | **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)
M.E/M.Tech I-Semester Regular Examinations, November 2015

Elective-I: (Large Scale Systems)

(Control Systems Engineering)

Date: **Time: 3 hours** **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

1 a) Write the reduction procedure for EXACT and MODAL AGGREGATION METHOD (4 M)

b) Consider a 3rd order unaggregated model

$$\dot{X} = \begin{bmatrix} -0.1 & 1 & 2 \\ 1 & -4 & 0 \\ 2 & 0 & -6 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix} U(t)$$ (8 M)

Find the second order aggregated model?

(or)

2 a) Write reduction procedure for chained aggregation method and descriptive variable method. **(6** M)
b) Write the algorithm for time invariance method (6 M)

3 a) Write the reduction procedure for moment matching method? (4 M)
b) Consider 7th order asymptotically stable system with a T.F using moment matching method = G(s) (8 M)

$$\frac{s^4 + 28s^3 + 260s^2 + 896s + 960}{s^7 + 41s^6 + 688s^5 + 6086s^4 + 30325s^3 + 83585s^2 + 114138s + 55440}$$

(or)

4 a) Write the reduction procedure for Pade Approximation Method. (5 M)
b) Use Pade Approximation Method to reduce the following 6th order system to a 2nd and 3rd systems. **(7** M)

$$G(s) = \frac{s^5 + 1014s^4 + 1469s^3 + 6914s^2 + 140100s + 100000}{s^6 + 2225s^5 + 14541s^4 + 248420s^3 + 1454100s^2 + 2220000s + 1000000}$$

5 a) Write the reduction procedure for α-β expansion method (5 M)

b) Use the Routh α-β expansion method to find the 2nd order reduce model (7 M)

$$G(s)=\frac{s^8+100s^7+8412.6332263s^6+11061.110109s^5+551748.13478s^4+1218911.641944s^3+1271923.672033s^2+551889.812645s+51741.75}{13s^9+490.664027s^8+6295.60s^7+42715.69s^6+207010.797378s^5+685430.157493s^4+1316478.480975s^3+1302712.0138s^2+554476.89s+51741.75}$$

(or)

6 a) Write the reduction procedure for three cauer form methods (4 M)

b) Find the 3rd reduced model for the system (8 M)

$$G(s=\frac{375000s+31248.75}{s^7+83.64s^6+4096s^5+70342s^4+853703s^3+281427s^2+331875s+281250}$$

Using three causer forms methods

7 Consider the transfer function matrix (12M)

$$H(s)=\frac{A_{21}+A_{22}s+A_{23}s^2}{a_1+a_2s+a_3s^2+a_4s^3}$$

Where $a_1=120, a_2=320, a_3=180, a_4=2$

$$A_{21}=\begin{bmatrix}240 & 200\\ 420 & 300\end{bmatrix}, A_{22}=\begin{bmatrix}180 & 80\\ 100 & 120\end{bmatrix}, A_{23}=\begin{bmatrix}50 & 40\\ 50 & 30\end{bmatrix}$$

Find a second order reduced model using MATRIX CFE and PADE – MODAL ,MODAL-CFEmethods.

(or)

8 a) Write the algorithm for MODAL-CFE Method? (6 M)

b) Write the reduction procedure for PADE-MODAL method? (6 M)

9 a) Write the algorithm and flow chart for model aggregation method. (6 M)

b) Explain briefly the singular perturbations method. (6 M)

(or)

10 a) Write the algorithm and flow chart for fast and slow sub systems (6 M)

b) Write about fast, optimal controllers and slow controllers. (6 M)