Assignment 6

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

1) (All the symbols carry their usual meanings)

The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

\[
\dot{X} = AX + BU
\]

where \( X = \begin{bmatrix} \Delta \omega_p \\ \Delta T_m \\ \Delta \theta \end{bmatrix} \) and \( U = \begin{bmatrix} \Delta \delta \end{bmatrix} \)

and A and B matrices are represented as follows:

\[
A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix}
\]

Where

\[
A = \begin{bmatrix} 0 & 143K_d & 377 \\ -0.108 & 0 & -0.108 \end{bmatrix}
\]

Find the undamped natural frequency of oscillation (in Hz) for \( K_d = 0 \)

a. 0.97-0.99
b. 1.0-1.02
c. 1.03-1.05
d. 1.06-1.08

No, the answer is incorrect.
The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

\[ \dot{X} = AX + BU \]

where \( X = \begin{bmatrix} \Delta \omega_p \\ \Delta \delta \end{bmatrix} \) and \( U = \begin{bmatrix} \Delta P_m \end{bmatrix} \)

and \( A \) and \( B \) matrices are represented as follows:

\[ A = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix}, \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix} \]

\[ A = \begin{pmatrix} -0.143 K_d & -0.108 \\ 377 & 0 \end{pmatrix} \]

Where

Find the damped natural frequency of oscillation (in Hz) for \( K_d = 0 \)

a. 0.97-0.99
b. 1.0-1.02
c. 1.03-1.05
d. 1.06-1.08

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

3)

The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

\[ \dot{X} = AX + BU \]

where \( X = \begin{bmatrix} \Delta \omega_p \\ \Delta \delta \end{bmatrix} \) and \( U = \begin{bmatrix} \Delta T \end{bmatrix} \)

and \( A \) and \( B \) matrices are represented as follows:

\[ A = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix}, \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix} \]

\[ A = \begin{pmatrix} -0.143 K_d & -0.108 \\ 377 & 0 \end{pmatrix} \]

Where

Find the damped natural frequency of oscillation (in rad/sec) for \( K_d = 15 \)

a. 6.52-6.54
b. 1.0-1.02
c. 6.28-6.30
d. 6.37-6.39

a
4) The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

$$\dot{X} = AX + BU$$

where $X = \begin{bmatrix} \Delta \omega_f \\ \Delta \delta \end{bmatrix}$ and $U = \begin{bmatrix} \Delta \omega_{f1} \\ \Delta \omega_{f2} \end{bmatrix}$

and A and B matrices are represented as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix}$$

$$A = \begin{bmatrix} -0.145K_d & -0.105 \\ 377 & 0 \end{bmatrix}$$

Find the damped natural frequency of oscillation (in rad/sec) for $K_d=15$

a. 6.52-6.54
b. 1.01-1.02
c. 6.28-6.30
d. 6.37-6.39

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

5) 1 point
The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

\[
\dot{X} = AX + BU
\]

where \( X = \begin{bmatrix} \Delta \omega_r \\ \Delta \delta \end{bmatrix} \) and \( U = \begin{bmatrix} \Delta T_m \end{bmatrix} \)

and \( A \) and \( B \) matrices are represented as follows:

\[
A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix}
\]

\[
A = \begin{bmatrix} -0.143K_d & -0.108 \\ 377 & -1 \end{bmatrix}
\]

Where

Find the damping ratio (\( \xi \)) of the system for \( K_d = 15 \)

a. (0.16)-(0.17)

b. (-0.15)-(0.17)

c. (-0.18)-(0.19)

d. (0.18)-(0.19)

No, the answer is incorrect.
Score: 0

Accepted Answers:

a

6)

The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

\[
\dot{X} = AX + BU
\]

where \( X = \begin{bmatrix} \Delta \omega_r \\ \Delta \delta \end{bmatrix} \) and \( U = \begin{bmatrix} \Delta T_m \end{bmatrix} \)

and \( A \) and \( B \) matrices are represented as follows:

\[
A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix}
\]

\[
A = \begin{bmatrix} -0.143K_d & -0.108 \\ 377 & -1 \end{bmatrix}
\]

Where

Find the damped natural frequency of oscillation (in rad/sec) for \( K_d = 15 \)

a. 6.52-6.54

b. 1.0-1.02

c. 6.28-6.30

d. 6.37-6.39

a
7) The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

$$\dot{X} = AX + BU$$

where $X = \begin{bmatrix} \Delta \omega_r \\ \Delta \delta \end{bmatrix}$ and $U = \begin{bmatrix} \Delta P \end{bmatrix}$

and $A$ and $B$ matrices are represented as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}, \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix}$$

$$A = \begin{bmatrix} -0.143K_d & -0.108 \\ 377 & 0 \end{bmatrix}$$

Find the damping ratio ($\xi$) of the system for $K_d = (-15)$

a. (0.16)-(0.17)

b. (-0.16)-(0.17)

c. (-0.18)-(0.19)

d. (0.18)-(0.19)

No, the answer is incorrect.
Score: 0
Accepted Answers: b

8) No, the answer is incorrect.
Score: 0
Accepted Answers: b
The state-space representation of a 3-phase synchronous generator represented by classical model is given as follows:

\[
\dot{X} = AX + BU
\]

where \( X = \begin{bmatrix} \Delta \omega_f \\ \Delta \delta \end{bmatrix} \) and \( U = \begin{bmatrix} \Delta J_{m} \end{bmatrix} \)

and \( A \) and \( B \) matrices are represented as follows:

\[
A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} \\ b_{21} \end{bmatrix}
\]

\[
A = \begin{pmatrix} -0.143 F_2 & -0.105 \\ 377 & 0 \end{pmatrix}
\]

Where

For \( K_2 = 15 \), find the participation matrix

a. \[
\begin{pmatrix} 0.5 + j0.0853 & 0.5 - j0.0853 \\ 0.5 + j0.0853 & 0.5 - j0.0853 \end{pmatrix}
\]

b. \[
\begin{pmatrix} 0.5 - j0.0853 & 0.5 + j0.0853 \\ 0.5 - j0.0853 & 0.5 + j0.0853 \end{pmatrix}
\]

c. \[
\begin{pmatrix} 0.5 + j0.0853 & 0.5 + j0.0853 \\ 0.5 - j0.0853 & 0.5 - j0.0853 \end{pmatrix}
\]

d. \[
\begin{pmatrix} 0.5 + j0.0853 & 0.5 - j0.0853 \\ 0.5 - j0.0853 & 0.5 + j0.0853 \end{pmatrix}
\]

No, the answer is incorrect.
Score: 0
Accepted Answers:
d
A 3-phase synchronous generator is connected to an infinite bus (bus no 2) via a three-phase double circuit line. The single line diagram of the system is shown in fig.1. All the reactances shown are in p.u. Bus 1 & Bus 3 represent the internal node and the terminal node of the synchronous generator respectively.

A solid 3-phase ground fault occurs in line 2 at a distance of 25% of the total length from Bus 3. Find the pre-fault bus admittance matrix \( (Y_{bus}) \) of the system (in p.u).

\[
\begin{pmatrix}
 j5.0 & 0 & j5.0 \\
 0 & j5.0 & j5.0 \\
 -j5.0 & 0 & j5.0 \\
 0 & -j5.0 & j5.0 \\
 -j5.0 & j5.0 & -j10.0 \\
 0 & -j5.0 & -j5.0 \\
 -j5.0 & -j5.0 & -j10.0 \\
 0 & j5.0 & -j5.0 \\
 -j5.0 & -j5.0 & j10.0
\end{pmatrix}
\]

No, the answer is incorrect.
Score: 0
Accepted Answers:

\[b\]

1 point
A 3-phase synchronous generator is connected to an infinite bus (bus no 2) via a three-phase double circuit line. The single line diagram of the system is shown in fig.1. All the reactances shown are in p.u. Bus 1 & Bus 3 represent the internal node and the terminal node of the synchronous generator respectively.

![Diagram of the system](https://onlinecourses-archive.nptel.ac.in/noc19_...)

A solid 3-phase ground fault occurs in line 2 at a distance of 25% of the total length from Bus 3. Find the reduced bus admittance matrix (Y_{ad}) (in p.u) of the system during fault.

\[
\begin{bmatrix}
-3.5714 & j0.7143 \\
j0.7143 & -j5.4729 \\
j3.5714 & -j0.7143 \\
j0.7143 & j5.4729 \\
j2.6916 & -j1.1542 \\
j1.1542 & j1.9229 \\
j2.6916 & j1.1542 \\
j1.1542 & -j1.9229 \\
\end{bmatrix}
\]

a. 

b. 

c. 

d. 

No, the answer is incorrect.
Score: 0

Accepted Answers:

a