CHAPTER-4. POWER SYSTEM

[1]Three generators are feeding a load of 100MW.The details of the generators are

	Rating(MW)	**Efficiency()**	**Regulation(p.u.)** on 100MVA base
Generator-1	100	20	0.02
Generator-2	100	30	0.04
Generator-3	100	40	0.03

In the event of increased load power demand, which of the following will happen? **[**GATE 2009**]**

A. All the generators will share equal power
B.Generator – 3 will share more power compared to Generator – 1
C.Generator – 1 will share more power compared to Generator – 2
D.Generator – 2 will share more power compared to Generator – 3
Ans: None of the above

[2]A 500MW, 21kV, 50Hz, 3-phase, 2-pole synchronous generator having a rated p.f. =0.9, has a moment of inertia of 27.5 x 10^3 kg-m^2. The inertia constant (H) will be **[**GATE 2009**]**

A.2.44 s
B.2.71s
C.4.88s
D.5.42s

[3]For a fixed value of complex power flow in a transmission line having a sending end voltage V, the real power loss will be proportional to **[**GATE 2009**]**

A.V
B.V^2
C.$1/V^2$
D.1/V

[4]How many 200W/220V incandescent lamps connected in series would consume the same total power as a single 100W/220V incandescent lamps? **[**GATE 2009**]**

A.Not possible
B.4
C.3
D.2

[5]Match the items in list I with the items in list II and select the correct **answer** using the codes given below the lists **[**GATE 2009**]**

LIST 1 **TO**	**LIST**2 **USE**
A.improve power factor	1.shunt reactor
B.reduce the current ripples	2.shunt capacitor
C.increase the power flow in line	3.series capacitor
D.reduce the ferranti effect	4.series reactor

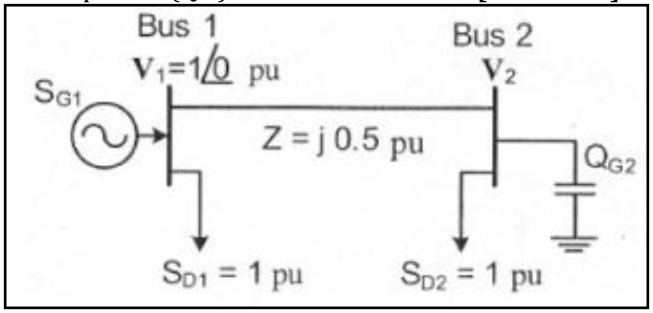
A. a→2,b→3,c→4,d→1
B. a→2,b→4,c→3,d→1
C. a→4,b→3,c→1,d→2
D. a→4,b→1,c→3,d→2

[6]Match the items in list I with the items in list II and select the correct **answer** using the codes given below the lists **[**GATE 2009**]**

LIST 1 **Type of Transmission Line**	**LIST**2 **Type of Distance Relay Preferred**
A.short line	1.Ohm Relay
B.Medium line	2.Reactance Relay
C.Long line	3.Mho Relay

A. a→2,b→1,c→3
B. a→3,b→2,c→1
C. a→1,b→2,c→3
D. a→1,b→3,c→2

[7] For the system shown below, S_{D1} and S_{D2} are complex power demands at bus 1 and bus 2 respectively. If $|V_2|$=1pu, the VAR rating of the capacitor (Q_{G2}) connected at bus 2 is **[**GATE2012**]**

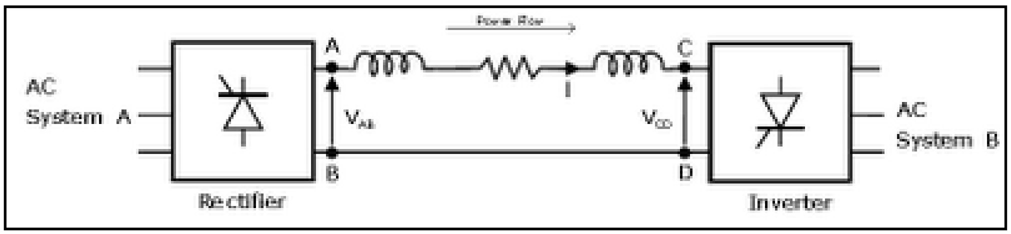


A. 0.2 pu
B. 0.268
C. 0.312
D. 0.4pu

[8] A cylindrical rotor generator delivers 0.5 pu power in the steady-state to an infinite bus through a transmission line of reactance 0.5 pu. The generator no-load voltage is 1.5 pu and the infinite voltage is 1.5 pu. The inertia constant of the generator is 5MW-s/MV and the generator reactance is 1 pu.The critical clearing angle, in degrees, for a three-phase dead short circuit fault at the generator terminal is **[GATE2012]**

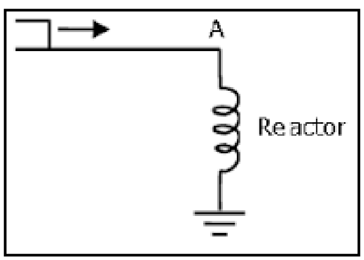
A. 53.5
B. 60.2
C. 70.8
D. 79.6

[9] Power is transfered from system A to system B by an HVDC link as shown in the figure.If the voltages V_{AB} and V_{CD} are as indicated in the figure, and I>0,then



A. $V_{AB}<0, V_{CD}<0, V_{AB}>V_{CD}$
B. $V_{AB}>0, V_{CD}>0, V_{AB}>V_{CD}$
C. $\mathbf{V_{AB}>0, V_{CD}>0, V_{AB}<V_{CD}}$
D. $V_{AB}>0, V_{CD}<0$

[10] Consider a step voltage wave of magnitude 1pu travelling along a lossless transmission line that terminates in a reactor.The voltage magnitude across the reactor at the instant the travelling wave reaches the reactor is



A. -1pu
B. 1pu
C. 2pu
D. 3pu

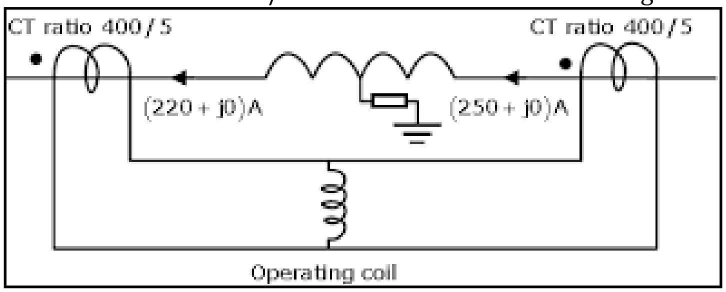
[11] Consider two buses connected by an impedance of (0+j5)Ω. The bus 1 voltage is 100∠30° V, and bus 2 voltage is 100∠0° V. The real and reactive power supplied by bus 1, respectively are

A. 1000W,268Var
B. -1000W,-134Var
C. 276.9W,-56.7Var
D. -276.9W,56.7Var

[12] A three-phase, 33kV oil circuit breaker is rated 1200A, 2000MVA, 3s. The symmetrical breaking current is

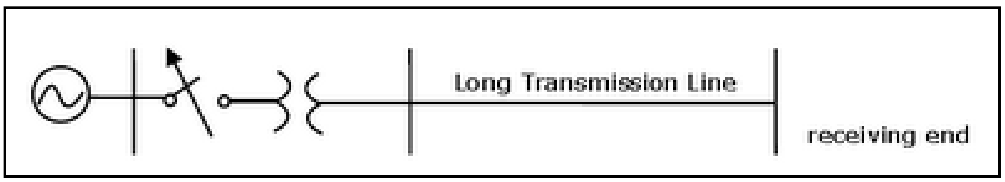
A. 1200A
B. 3600A
C. 35kA
D. 104.8kA

[13] Consider a stator winding of an alternator with an internal high-resistance ground fault.The currents under the fault condition are as shown in the figure.The winding is protected using a differential current scheme with current transformers of ratio 400/5A as shown. The current through the operating coil is



A. 0.17875A
B. 0.2A
C. 0.375A
D. 60kA

[14] A 50Hz synchronous generator is initially connected to a long lossless transmission line which is open circuited at the receiving en**D.**With the field voltage held constant, the generator is disconnected from the transmission line.Which of the following may be said about the steady state terminal voltage and field current of the generator?



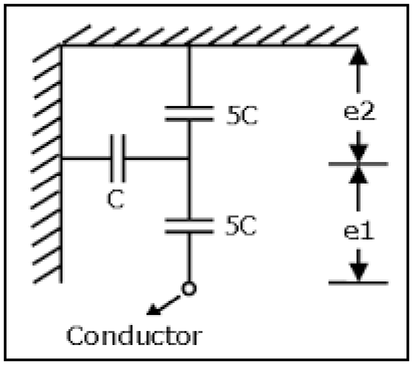
A. The magnitude of terminal voltage decreases,and the field current does not change
B. The magnitude of terminal voltage increases,and the field current does not change
C. The magnitude of terminal voltage increases,and the field current increases
D. The magnitude of terminal voltage does not change,and the field current decreases

Ans: none of the above

[15] For enhancing the power transmission in a long EHV transmission line, the most preferred method is to connect a

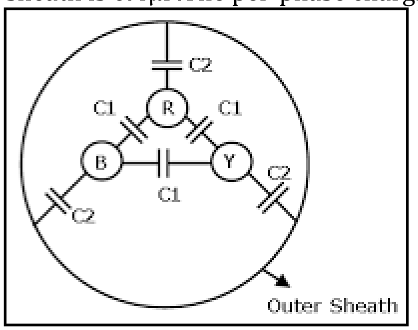
A. series inductive compensator in the line
B. shunt inductive compensator at the receiving end
C. series capacitive compensator in the line
D. shunt capacitive compensator at the sending end

[16] Consider a three-phase,50Hz,11kV distribution system.Each of the conductors is suspended by an insulator string having two identical porcelain insulators.The self capacitance of the insulator is 5 times the shunt capacitance between the link and the ground,as shown in the figure.The voltage across the two insulators is



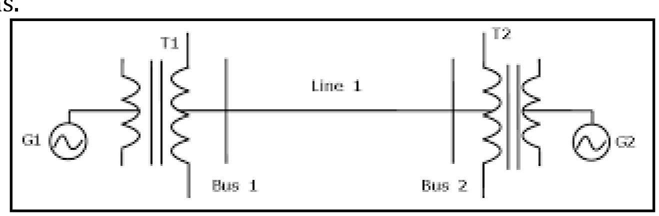
A. e1=3.74kV,e2=2.61kV
B. e1=3.46kV,e2=2.89kV
C. e1=6.0kV,e2=4.23kV
D. e1=5.5kV,e2=5.5kV

[17] Consider a three-core, three-phase,50Hz,11kV cable whose conductors are denoted as R,Y and B in the figure.The inter-phase capacitance(C1) between each pair of conductors is 0.2μF and the capacitance between each line conductor and the sheath is 0.4μF.The per-phase charging current is

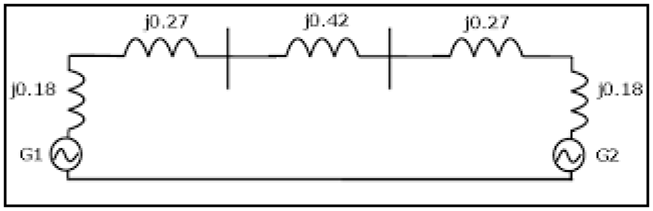


A. 2.0A
B. 2.4A
C. 2.7A
D. 3.5A

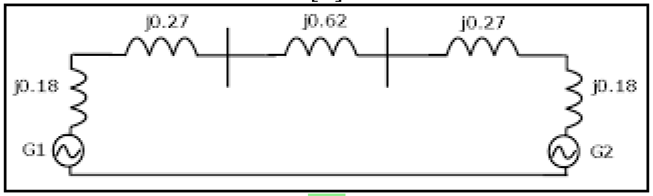
[18] For the power system shown in the figure below,the specifications of the components are the following:
G1: 25kV,100MVA,X=9%
G2: 25'kV,100MVA,X=9%
T1: 25kV/220kV,90MVA,X=12%
T2: 220kV/25kV,90MVA,X=12%
Line1: 220kV, X=150 ohms.



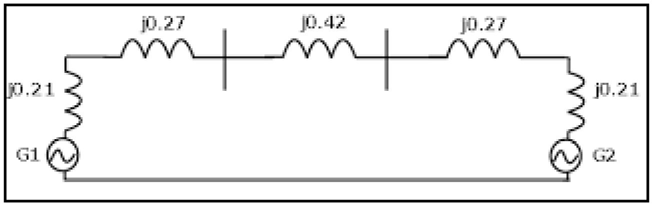
Choose 25kV as the base voltage at the generator G1 and 200MVA as the MVA base.The impedance diagram is.....Options A,B,C,D are given below


j0.27
j0.42
j0.27
j0.18
j0.18
G1
G2

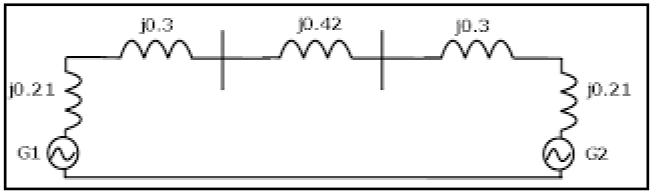
[A]


j0.27
j0.62
j0.27
j0.18
j0.18
G1
G2

[B]


j0.27
j0.42
j0.27
j0.21
j0.21
G1
G2

[C]


j0.3
j0.42
j0.3
j0.21
j0.21
G1
G2

[D]

Ans:B