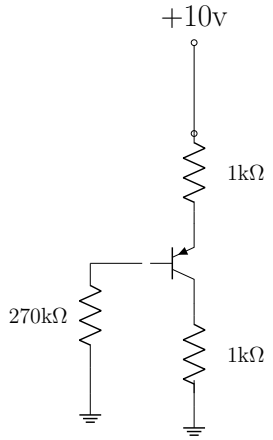
ASSIGNMENT 1

EE24BTECH11011 - PRANAY

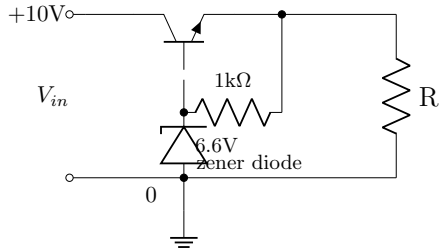
1) The common emmiter forward current gain of the transistor shown is β_F = 100



The transistor is operating in

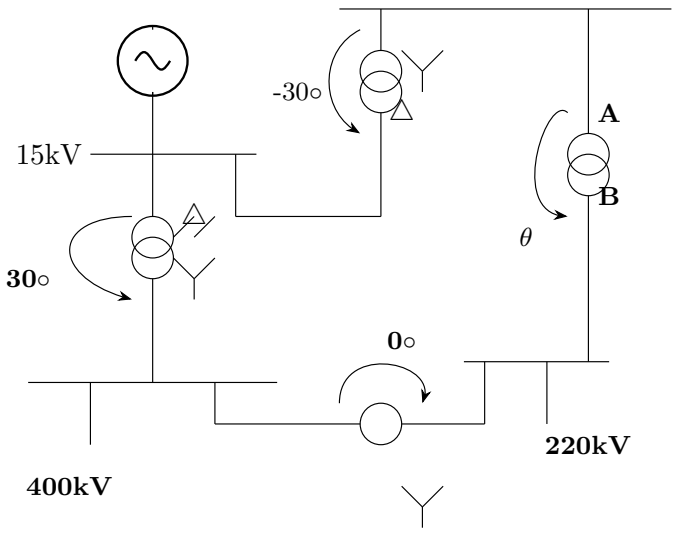
a) saturation region
b) cutoff region
c) reverse active region
d) forward active region

2) The three terminal linear voltage regulator is connected to a 10Ω load resistor as shown in the figure.If V_{in} is $10V$, what is the power dissipated in the transistor?



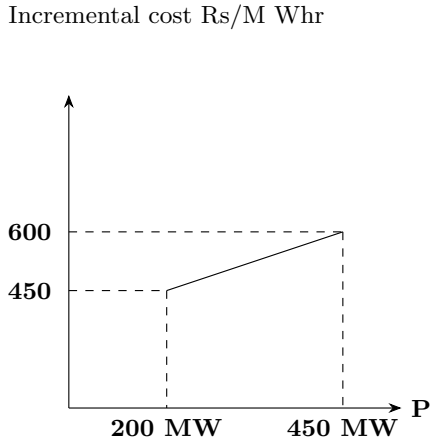
a) $0.6W$
b) $2.4W$
c) $4.2W$
d) $5.4W$

3) Consider the transformer connections is a part of a power system shown in the figure.The nature of the transformer connections and phase shifts are indicated for all but one transformer. Which of the following connections,and the corresponding phase shift θ , should be used for the transformer between **A** and **B**?

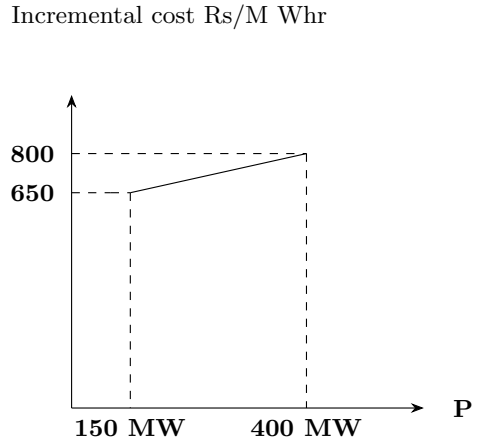


a) Star - Star ($\theta = 0°$)
b) Star - Delta ($\theta = -30°$)
c) Delta - Star ($\theta = 30°$)
d) Star - Zigzag ($\theta = 0°$)

4) The incremental cost curves in Rs/M Whr for two generators supplying a common load of 700MW are shown in the figures.The maximum and minimum generation limits are also indicated.The optimum generation schedule is :



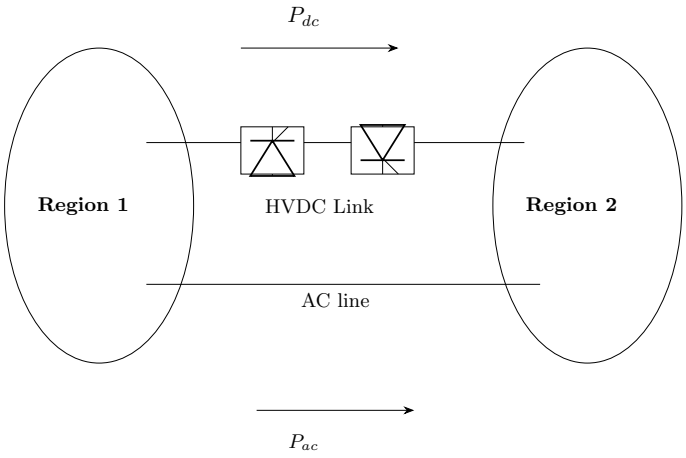
GENERATOR A



GENERATOR B

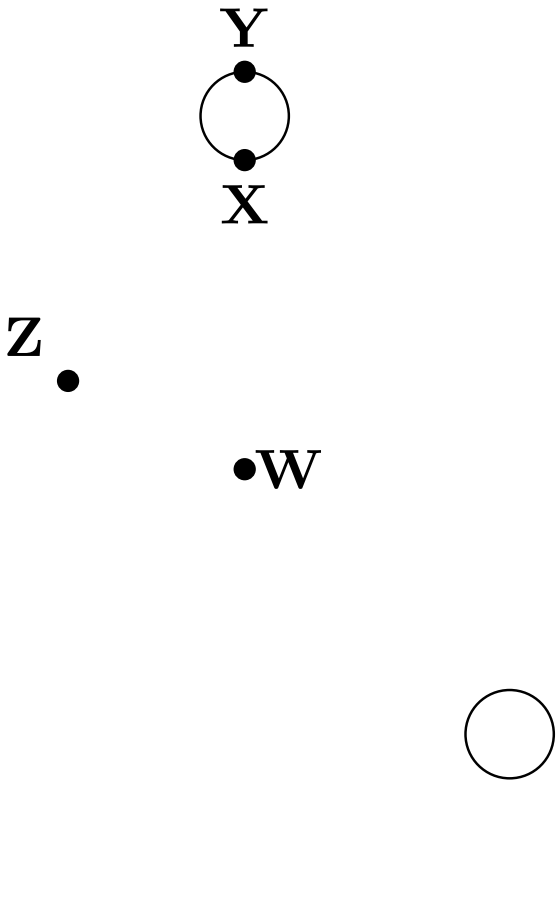
a) Generator **A**: 400MW, Generator **B**: 300MW
b) Generator **A**: 350MW, Generator **B**: 350MW
c) Generator **A**: 450MW, Generator **B**: 250MW
d) Generator **A**: 425MW, Generator **B**: 275MW

5) Two regional systems, each having several synchronous generators and loads are interconnected by an ac line and a HVDC link as shown in the figure. Which of the following statements is true in the steady state:



a) Both regions need not have the same frequency
b) The total power flow between the regions $P_{ac} + P_{dc}$ can be changed by controlling the HVDC converters alone
c) The power sharing between the ac line and the HVDC link can be changed by controlling the HVDC converters alone
d) The direction of power flow in the HVDC link P_{dc} cannot be reversed.

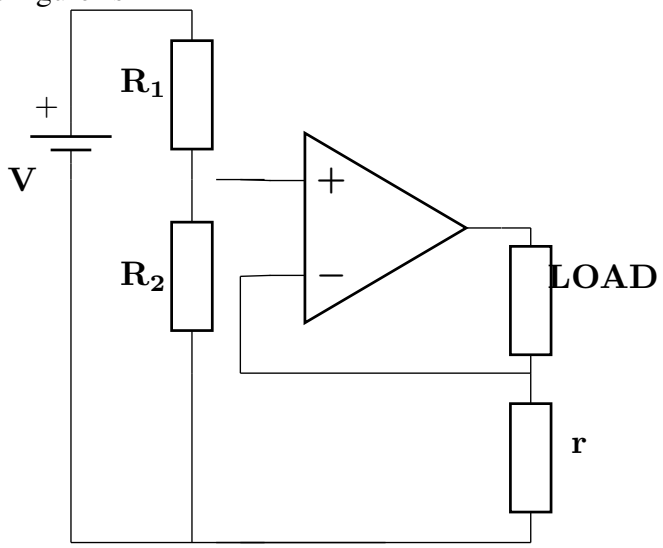
6) Consider a bundled conductor of an overhead line, consisting of three identical sub-conductors placed at the corners of an equilateral triangle as shown in the figure. If we neglect the charges on the other phase conductors and ground, and assume that spacing between sub-conductors is much larger than their radius, the maximum electric field intensity is experienced at



a) Point X

b) Point Y
c) Point Z
d) Point W

7) The circuit shown in the figure is



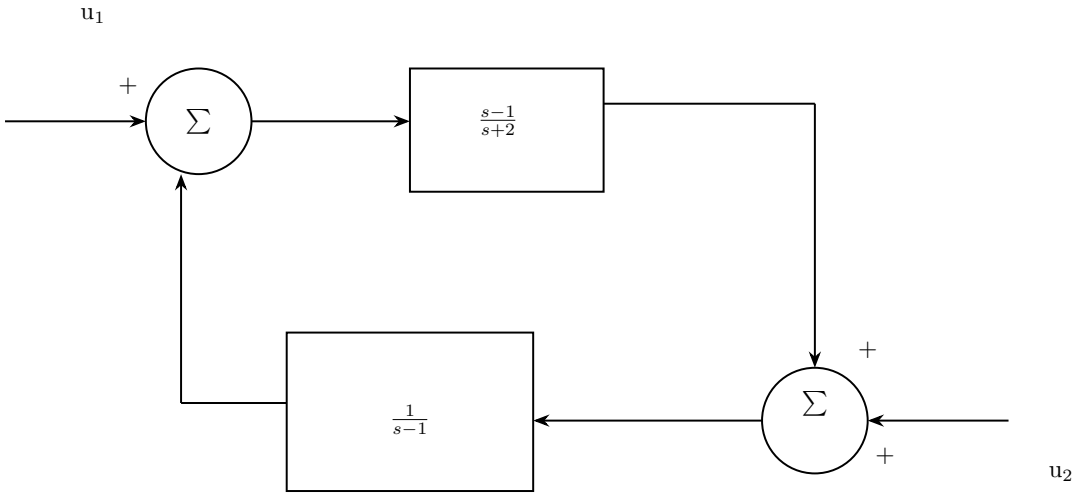
a) a voltage source with voltage $\frac{rV}{R_1//R_2}$

b) a voltage source with voltage $\frac{r//R_2}{R_1}V$

c) a current source with current $\frac{r//R_2}{R_1+R_2}\frac{V}{r}$

d) a current source with current $\frac{R_2}{R_1+R_2}\frac{V}{r}$

8) The system shown in the figure is

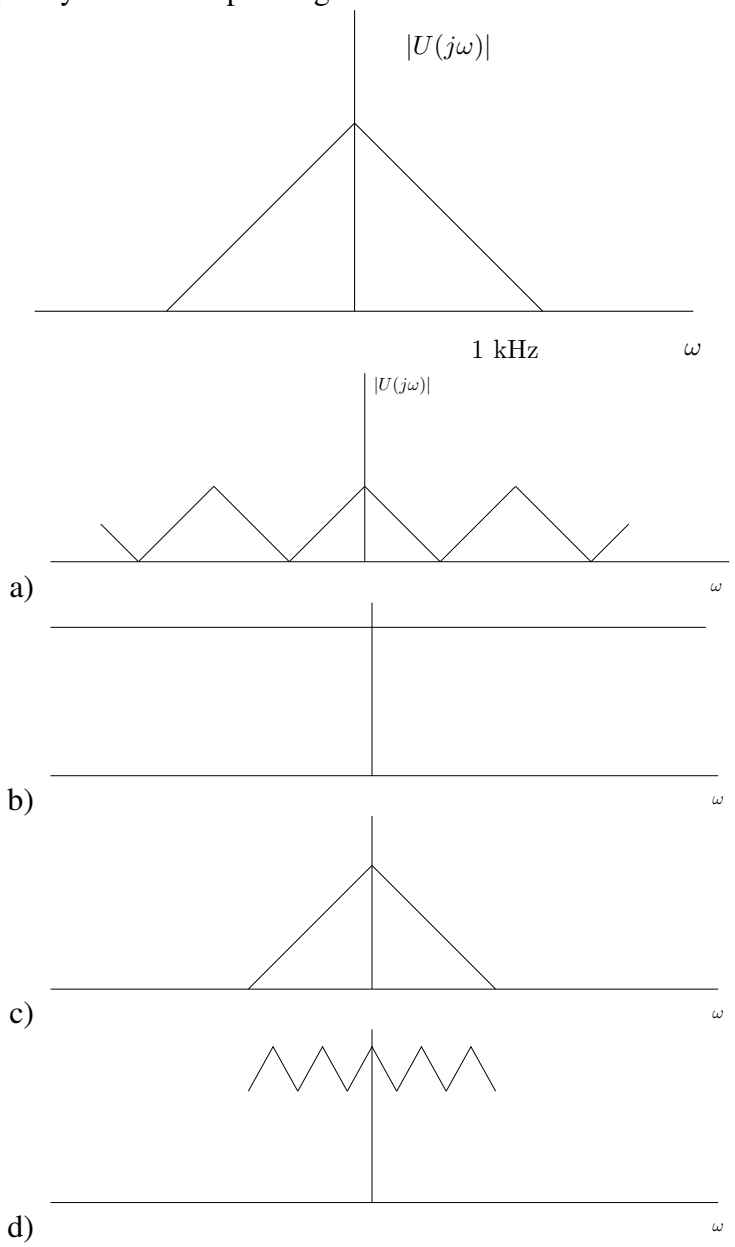


a) stable
b) unstable
c) conditionally stable
d) stable for output u_1 but unstable for input u_2

9) Let a signal $a_1 \sin(\omega_1 t + \phi_1)$ be applied to a stable linear time-invariant system. Let the corresponding steady state output be represented as $a_2 F(\omega_2 t + \phi_2)$. Then which of the following statements is true?
a) F is not necessarily a "sine" or "cosine" function but must be periodic with $\omega_1 = \omega_2$.

b) F must be a "sine" or "cosine" function with $a_1 = a_2$.
c) F must be a "sine" function with $\omega_1 = \omega_2$ and $\phi_1 = \phi_2$.
d) F must be a "sine" or "cosine" function with $\omega_1 = \omega_2$.

10) The frequency spectrum of a signal is shown in the figure.If this signal is ideally sampled at intervals of 1 ms,then the frequency of the sampled signal will be



11) Divergence of the vector field

$$\mathbf{A}(x, y, z) = -(x\cos xy + y)\,\mathbf{i} + (y\cos xy)\,\mathbf{j} + \left(\sin z^2 + x^2 + y^2\right)\mathbf{k} \tag{1}$$

is

a) $2z\cos z^2$
b) $\sin xy + 2z\cos z^2$
c) $x\sin xy - \cos z$
d) none of these

12) $\mathbf{x} = [x_1 x_2 \ldots x_n]^\top$ is a $n-$ multiple non-zero vector.Then $n \times n$ matrix $\mathbf{V} = \mathbf{x}\mathbf{x}^\top$

a) has rank zero
b) has rank 1
c) is orthogonal
d) has rank n

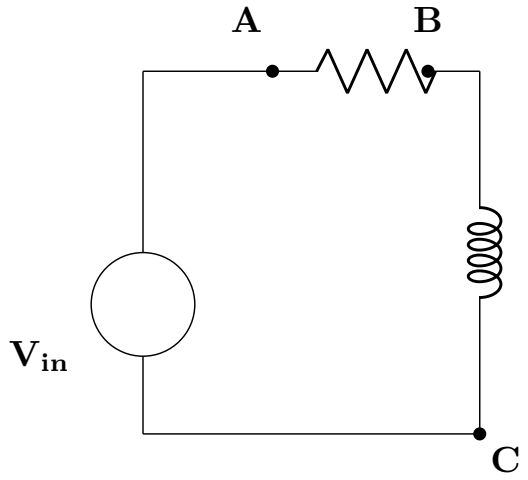
13) A single-phase fully controlled thyristor bridge ac-dc converter is operating at a firing angle of 25° and an overlap of angle 10° with a cnstant dc output of 20A.The fundamental power factor(displacement current) at input ac mains is
a) 0.78
b) 0.827
c) 0.866
d) 0.9

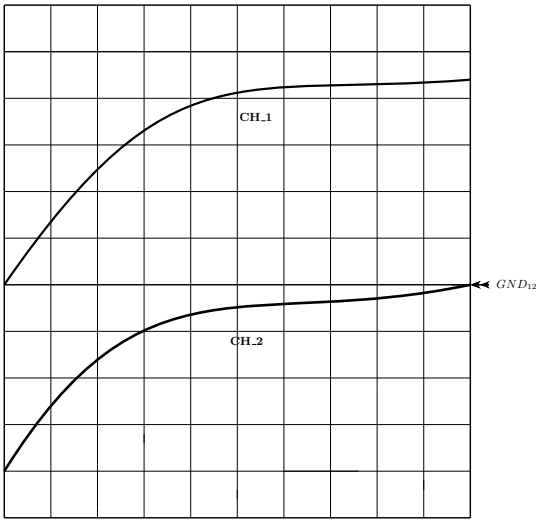
14) A three-phase, fully-controlled thyristor bridge converter is used as line commutated inverter to feed 50 kW power at 420 V dc to a three-phase, 415 V (line), 50 Hz ac mains. Consider dc link current to be constant. The rms current of the thyristor is
a) 119.05 A
b) 79.37 A
c) 68.73 A
d) 39.68A

15) In a transformer, zero voltage regulation at full load is
a) not possible
b) possible at unity power factor load
c) possible at leading power factor load
d) possible at lagging power factor load

16) The dc motor, which can provide zero speed regulation at full load without any controller, is
a) series
b) shunt
c) cumulative compound
d) differential compound

17) The probes of a non-isolated, two-channel oscilloscope are clipped to points A, B, and C in the circuit of the adjacent figure. V_{in} is a square wave of a suitable low frequency. The display on Ch_1 and Ch_2 are as shown on the right. Then the Signal and Ground probes S_1, G_1 and S_2, G_2 of Ch_1 and Ch_2respectively are connected to points:





a) A, B, C, A
b) A, B, C, B
c) C, B, A, B
d) B, A, B, C