1.Q. Calculate the wavelength corresponding to a frequency of 1 MHz (AM radio broad cast band) 30 MHz (Amateur radio) and 4 GHz (satellite communication).

= when $f = 1\ MHz$

$$\lambda = \frac{c}{f} = \frac{3 \times 10^8}{1 \times 10^6} = \underline{300\ m}$$

when $f = 30\ MHz$

$$\lambda = \frac{c}{f} = \frac{3 \times 10^8}{30 \times 10^6} = \underline{10\ m}$$

when $f = 4\ GHz$

$$\lambda = \frac{c}{f} = \frac{3 \times 10^8}{4 \times 10^9} = \underline{0.075\ m} = \underline{7.5\ cm}$$

2.Q Suppose that a voice frequency of 800 Hz is transmitted on an AM radio station operating at 1020 KHz. Which one is the frequency of carrier signal and baseband signal?

= Carrier frequency = 1020 KHz

Baseband frequency = 800 Hz

3.Q. Express 1W, 2W, 4W and 10 W power in dBm.

$= P(dBm) = 10 \log_{10}\left(\frac{P(W)}{1mW}\right)$

For 1 W :- [1 W means 1000 mW

$P(dBm) = 10 \log_{10}\left(\frac{1000}{1}\right)$

$= 10 \log_{10}(1000)$

$= \underline{30\ dBm}$

For 2 W :-

$P(dBm) = 10 \log_{10}(2000)$

$= \underline{33.01\ dBm} = \underline{33\ dBm}$

For 4 W :-

$P(dBm) = 10 \log_{10}(4000)$

$= \underline{36.02\ dBm} = \underline{36\ dBm}$

For 10 W :-

$P(dBm) = 10 \log_{10}(10000)$

$= \underline{40\ dBm}$

4.Q. An amplifier has an input power of 100 mW and output power of 200mW. What is its power gain in dB?

$= G(dB) = 10 \log\left(\frac{P_{out}}{P_{in}}\right)$

Power gain in dB

$= 10 \log\left(\frac{200\ mW}{100\ mW}\right)$

$= 10 \log(2)$

$= 3.01\ dB$

$= \underline{3\ dB}$

5.Q. The transmission power of a communication system operating at 900 MHz is 40 W. Express the transmitter power in units of dBm.

$= P(dBm) = 10 \log_{10}\left(\frac{P(mW)}{1\,mW}\right)$

$P = 40\,W$

$40\,W = 40{,}000\,mW$

$= 10 \log_{10}\left(\frac{40000}{1}\right)$

$= 10 \log_{10}(40000)$

$= 46.02\,dBm$

$= \underline{46\,dBm}$

6.Q A wireless communication transmitter radiates 50W of RF signal power. Express the transmitter power in units of dBm and dBW.

- converting 50 w to dBm

$P(dBm) = 10 \log\left(\frac{P(W)}{1\,mW}\right)$

$= 10 \log\left(\frac{50000}{1}\right)$

$= 10 \log(50000)$

$= 46.989$

$= \underline{47\,dBm}$

$\therefore 50W = \underline{47\,dBm}$

converting dBm to dBW

$1\,W = 0\,dBW = 30\,dBm$

$P(dBW) = P(dBm) - 30$

$= 47 - 30$

$= \underline{17\,dBW}$