**Department of Electrical Engineering**
**Indian Institute of Technology, Kanpur**

**EE 210** **END-SEM P4** **6.5.21**

a) A system has low-frequency gain of 50 dB, and two negative real poles, having pole frequencies at 1 Mrad/sec and 100 Mrad/sec.
   i) What is its unity-gain bandwidth? **2**
   ii) If it is used in a negative feedback configuration, determine the feedback factor (f), at which the poles would *just* start to have imaginary components. **2**
   iii) If f is increased beyond the value calculated in part ii), comment on the stability of the system, giving clear physical justification(s). **3**

b) Under unity negative feedback, the loop gain characteristic of a 3-pole (all negative and real) system is found to cross 0 dB at 2 MHz, with the total phase at this point equal to −120°.
   i) What is the phase margin of the system? **1**
   ii) Is the gain margin positive or negative? Justify. **1**
   iii) Based on the answers of parts i) and ii), comment on the stability of the system. **1**
   iv) If the locations of the second and third pole frequencies are 3 MHz and 5 MHz respectively, find the location of the first pole frequency. **2**