

18-12-2015



School of Environment & Natural Resources (SENR)

End Semester 2015 (Monsoon Semester)

M.Sc. (EVS) – IIIrd Semester

EES-570 : Science of Climate Change

Max Marks : 50

Time : 3 hours

Section B : Solve the following

(5 Marks each)

1. Use Wien's displacement law to compute the "color temperature" of the sun, for which wavelength of maximum solar emission is observed $\sim 0.475 \mu\text{m}$. (Wien's constant = $2897 \mu\text{m}/\text{K}$)
2. Suppose glacial melting causes the earth's albedo to change from 0.31 to 0.30. Estimate the resulting radiative forcing. If the climate sensitivity factor is somewhere between 0.34 and $1.03^\circ\text{C}/\text{W/m}^2$, estimate the change in surface temperature. (Solar constant, $S = 1370 \text{ W/m}^2$)
3. Calculate the temperature of the Earth in the absence of green-house effect. (Stefan Boltzman Constant, $\sigma = 5.67 \times 10^{-8} \text{ W/m}^2\text{-K}^4$)
4. Which are the major GHG drivers of climate change? Which has the maximum contribution to radiative forcing? Which GHG contribution to positive radiative forcing is balanced by negative radiative forcing due to its activity in stratosphere and how?

Section C : Answer the following

(10 Marks each)

1. What is Optical depth? How does it differ for optically thin and optically thick layer? Derive the optical depth relation in both cases. What is the relation between optical depth and partial pressure for a gas? What is the relation between emissivity and optical depth? Discuss the relation between surface temperature of the earth, effective temperature and optical depth.
2. What is climate model? What are the components of a climate model? What are the seven basic equations of atmosphere? Describe each term and its significance.
3. Answer any one of the following ;
 - (i) Is the ocean Warming?
 - (ii) How does Anthropogenic Ocean Acidification relate to Climate Change?
 - (iii) Are glaciers in Mountain regions disappearing?
 - (iv) How do clouds affect climate and climate change?
 - (v) Are climate models getting better, and how would we know?
 - (vi) How will the earth's water cycle change?
 - (vii) How is Climate Change Affecting Monsoons?
 - (viii) Could Rapid Release of Methane and Carbon Dioxide from Thawing Permafrost or Ocean Warming Substantially Increase Warming?