DEPARTMENT OF CIVIL ENGINEERING: IIT DELHI

SEM-II: 2006-07

CEL 718: DESIGN OF STEEL STRUCTURES

MAJOR TEST

Max. Marks=40 **<u>All questions are compulsory</u>** **Duration = 2 hrs**

1. Starting ab initio, develop an expression for the value of the critical flexural moment about the major principal axis for lateral buckling of a deep cantilever with rectangular cross-section.

10 marks

2. A simply supported steel beam of span 12m is under the action of a concentrated live load P acting at mid-span and self-weight of intensity q. The relevant data on normal probability distribution of yield strength f_y, self weight q and concentrated load P are as under:

Variable (X_i)	Mean Value (μ_i)	Coefficient of Variance (δ_i)
Yield Strength : X_1	500 MPa	0.1
Dead Load: X_2	20 N/mm	0.05
Live Load: X_3	$100X10^3$ N	0.3

Determine the partial safety factors for the mean value of material strength as well as dead and live loads for a target reliability of 5.

15 marks

3. a) Write a short note on the MERCHANT-RANKINE FORMULA in the particular reference to its use in the determination of inelastic buckling loads of plane frames.
   b) Distinguish between ORDINARY and SPECIAL MOMENT RESISTING FRAMES in the context of seismic design of steel frames.
   c) Discuss the Moment-Rotation characteristics of semi-rigid beam-column connections.

5+5+5=15 marks