Total No. of Questions: 08 Seat No:

M. E. (Mechanical) Design Engineering

ELECTIVE – III

(DE2III -M3-CAE – I; DE2III –M4-CAE – II; DE1III –M9-Reliability Engineering)

2013-Course (602215)

Time: 3 Hours. Max. Marks: 50

Instructions:

1. **Figures to the right indicate full marks.**
2. **Answer Q.1 or Q.2, Q.3 or Q.4 and Q.5 or Q.6**
3. **Question number 7 and 8 are compulsory**

CAE-I

Q. 1 a) Explain in detail basic steps involved in solving engineering problem using CAE? (5)
b) What are meshing techniques? (3)
c) Describe type of Elements. How element selection is done? (2)

OR

Q. 2 a) List all possible CAE driven analysis and describe each one very briefly. (5)
b) Explain in detail the difference between linear and non-linear analysis with example. (3)
c) Explain P and H technique of mesh refinement with neat sketch. (2)

Q. 3 a) Write a note Block Lanczos and QR damped methods of modes extraction (5)
b) Describe in detail how would you leverage Modal Analysis for the Design Process (3)
c) What is buckling analysis? (2)

OR

Q. 4 a) What are element quality check parameters? Explain in brief. (5)
b) What are Loads, Initial conditions and Boundary conditions? (3)
c)Write a note on FEM solution convergence. (2)

CAE-II

Q5 a) Derive the expression for guyan condensation? (5)
b) Define and explain pre-stressed analysis? (3)
c) Define harmonic response analysis? Explain analysis steps involved in it? (2)

OR

Q6 a) Explain General transformation of harmonic response analysis? (5)
b) What are the applications of harmonic response analysis? List different methods involved in it? (3)
c) What is rigid body mode explain? (2)

OR

Q7 a) Explain dynamic equations of motion in detail ? (5)
b) Define transient and frequency response analysis ? (3)
c) what is dynamic modeling input? (2)

Seat No: [ ]

Q8 a) The function of a experiment is monitored continuously by three observation stations. A, B and C, functioning independently. It is necessary that at least one of them function satisfactorily to monitor the progress of the experiment. Each of these observation stations receives power supply from two independent sources connected in parallel. A receives power from D and E, B receives power from F and G and C receives power from H and J. For each observation station power from any one source is sufficient for operation. Draw the block diagram and the fault-tree diagram for the system. Also, calculate the reliability of the system. The reliabilities of observation stations and failure rates of power sources can be referred from following table.[10] (10)

Characteristics	Observation stations			Power sources					
	The reliability			The probability of failure					
	A	B	C	D	E	F	G	H	J
Components	0.955	0.965	0.975	0.004	0.003	0.005	0.007	0.007	0.005