B.E. (Full Time) DEGREE **ARREAR** EXAMINATIONS, April /MAY 2011
INDUSTRIAL ENGINEERING
FIFTH SEMESTER **(Regulations 2004)**
IE 373 ENGINEERING QUALITY CONTROL

Time; 3 hr Max.Mark: 100

Use of Statistical Tables Permitted
Answer All Questions
Part – A (!0 x 2 = 20 Marks)

1. A lot of size N = 30 contains 3 defectives. What is the probability that a sampie of 5 units selected at random contains exactly one defective?
2. What is quality of design?
3. What are the causes for chance variation in a manufacturing process?
4. What criteria are used to detect lack of control on $\overline{X}$ chart?
5. How do you interpret a C- chart?
6. How statistical tolerances are fixed for components?
7. What are the advantages of using individual measurement charts?
8. Distinguish between control chart for averages and moving average chart.
9. What are the advantages of acceptance sampling?
10. What is AOQL?

Part – B (5 x 16 = 80 Marks)

11. Control charts for $\bar{X}$ and R are maintained on a particular quality characteristic.

After 25 samples of size n= 5, we find that $\Sigma \bar{X}$ = 662.50 and Σ R = 9.00

a. Compute control limits for the $\bar{X}$ and R – Charts.
b. Assuming that the process exhibits control estimate μ and σ.
c. If the process output is normally distributed and the specification is 26.40 ± 0.50, estimate the fraction nonconforming.
d. Where should the mean be located to minimize the fraction nonconforming?
e. If the process shifts to 26.96, determine the probability of detecting the shift on the first sample.

12. a i) Why to measure quality costs? Explain the various types of quality costs. (8)

ii) Discuss how required product quality can be achieved systematically in an industry? (8)

(OR)

b) A manufacturing process has been operating in control at a mean of 65.00 mm with upper and lower control limits of 65.225 and 64.775 respectively. The process standard deviation is known to be 0.15 mm and specifications on the dimension are 65.00 ± 0.50 mm.

i) What is the probability of not detecting the shift in the mean to 64.75 mm on the first sample taken after the shift? The sample size is four.
ii) What proportion of nonconforming product result from the shift mentioned in (i)?
iii) Compute the process capability indexes C_p and C_{pk} for this process and comment relative to part (i) and (ii) above.

13 a. i) Describe the procedure for conducting the process capability study using control charts.
ii) The average clearance specified between two mating parts A and B is 0.0075cm. The distribution of A and B are normal with standard deviations of 0.0014 and 0.0026 respectively. Assembly is at random. Perform necessary calculations to determine the probability of Interference between the two parts.

(OR)

b i) The following data has been collected from a small textile mill. Develop a suitable control chart for monitoring the defects.

Day :	1	2	3	4	5	6	7	8	9	10
Bolts of Cloth :	20	20	20	21	22	22	23	33	23	21
No.of defects:	37	23	30	28	34	31	37	24	36	27

ii) A process produces rubber belts in lots of 2500. Inspection records on the last 20 lots revealed the following number of nonconforming belts.
230, 435, 221, 346, 230, 327, 285, 311, 342, 308
456, 394, 285, 331, 198, 414, 131, 269, 221, 407
Develop a control chart for controlling the quality of future production.

14 a) Write short notes on the following.
i) Quality planning
ii) Demerit control chart
iii) Sequential sampling plan

(OR)