BACHELOR OF ENGINEERING IN PRODUCTION ENGINEERING EXAMINATION, 2017

(3rd Year, 1st Semester, Supplementary)

INSPECTION AND PRODUCT CONTROL (OLD)

Time : Three hours   Full Marks : 100

1. (a) While developing quality control charts, why 3-sigma limits are preferred? (4)

   (b) Mention the specific application areas of p, np, 100p and c charts. (4)

   (c) A fair percentage of a certain product requires costly rework operations to change a certain quality characteristic after the product has been rejected by the manufacturer's 100 percent final inspection. Rework is possible whenever the values of this quality characteristic falls above the upper specification limit. If the value falls below the lower specification limit, the product must be scrapped.

   X-bar and R control charts have been initiated and maintained for 50 subgroups of 5 each with samples taken from production every 2 hours. The specification requirements for the measured quality are 119±10 and σ of 5. On the assumption that the quality characteristic is normally distributed, approximately what percentage of defective product is being produced? How much of this can be reworked? (Given $\phi(1) = 0.8413$ and $\phi(-3) = 0.00135$) (12)

2. (a) What are the primary causes for generation of rough surface? How those can be avoided? (6)

   (b) How can a bearing area curve be interpreted? (3)

   (c) With a neat sketch, describe the working principle of Tomlinson Surfacemeter. (6)

   (d) How scratch inspection and micro-interferometers are used as indirect methods of surface roughness measurement? (5)

3. (a) State how can computer vision system be employed for product dimensional analysis. (6)

   (b) Describe how the radius of a sphere and taper angle can be measured using a coordinate measuring machine. (4)

   (c) With a neat sketch, describe the working principle of a Solex Pneumatic comparator. (6)

   (d) With respect to industrial metrology, provide examples of indirect and interpolation methods of measurement. (4)

4. (a) Define 'readability' and 'sensitivity'. How readability and sensitivity of a measuring instrument can be increased? (4+4)

   (b) How the errors in measurement can be minimized? (4)

   (c) Develop a cause and effect diagram for too many defective components produced from a vertical drilling machine. (4)

   (d) What do you understand by the term "Process is in control"? (4)

5. (a) Daily inspection records are maintained on production of a special-design electronic device. 100 items have been inspected each day for the past 21 days. A total of 546 items failed during a particularly severe heat stress test. The four highest and lowest values of p are: (8)

Highest	0.46	0.33	0.31	0.31
Lowest	0.18	0.18	0.20	0.21

   Compute the trial 3-sigma control limits for a p-chart. Is the process operating in control? Recommend the aimed-at value of p and 3-sigma control limits for continued use of the p-chart. (8)

   (b) Write short notes on the followings: (3x4)

   (i) Mechanical optical comparator, (ii) American Standard Tolerance Association System and (iii) Gauges and its various types.