Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2016

Subject Code:171402 **Date:07/05/2016**

Subject Name:Food Standards and Quality Assurance

Time:02:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Answer the following questions: **07**

(i) If standard deviation of Poisson's distribution is $\sqrt{2}$, calculate P (1 or 2).
(ii) What do you understand by symmetrical distribution?
(iii) Calculate P (AB) for two equally likely, exhaustive and independent events.
(iv) What is UMVUE?
(v) Calculate the degrees of freedom of a normal distribution.
(vi) State applications of dilution test.
(vii) State prospective sources for recruitment of sensory panels.

(b) Answer the following questions in short: **07**

(i) Why employees are considered an essence of an organization?
(ii) Differentiate between customer satisfaction and enchantment.
(iii) Briefly introduce SQF 1000.
(iv) Auditing of organization facilitates training of employees. Justify.
(v) AGMARK standards facilitate consumer to choose the product. Justify.
(vi)Define quality control and quality assurance.
(vii) What are advantages of Idophor as disinfecting agent?

Q.2 **(a)** If O_i and E_i be the set of observed and expected frequencies (i = 1, 2, 3, 4……n) **07**

for a data set of size N, prove that $\chi^2 = \sum_{i=1}^{n}\left[\frac{O_i^2}{E_i} - N\right]$.

The expected and observed daily sales data for a branded food product in different cities is given below:

City	City1	City2	City3	City4	City5
Expected sales in units/day	311	350	110	90	150
Observed sales in units/day	305	365	100	85	156

(i) What is the mean daily sale of the product?
(ii) To what extent the observed and expected sales are in agreement with each other? Comment at 5% significance level.

[Take $\chi^2 = 9.49 \; for\, d.f. = 4, \alpha = 5\%$]

(b) What is normal distribution? State its properties. How does it find application in quality control? Examine the probability distribution function given below: **07**

$$f(x) = ke^{\frac{(6-x)^2}{50}}, \quad -\infty < x < +\infty$$

Demonstrate that the above function is that of a normal variate. Find its mean, standard deviation, variance and value of k.

OR

(b) Write short notes supporting your answers with relevant examples. **07**

(i) Application of ANOVA technique in quality control of foods.
(ii) Non-parametric tests.
(iii) One and two tailed tests.
(iv) Null hypothesis.
(v) Neyman and Pearson Lemmas.
(vii) Degrees of freedom of a distribution.
(vii) Multiple sample difference tests.

Q.3 **(a)** Explain the applications of t-test in quality control and state its limitations. The standard plate count in a canned mango pulp is to be limited to 20 after one year under normal storage conditions. After one year 10 samples were randomly picked up from a large lot and their SPC was experimentally determined. The mean SPC of the 10 samples was calculated as 20.8 and its standard deviation was 1.1. Perform a t-test to demonstrate if the estimated SPC is in agreement with its specified limit. Comment on α = 5% and 1%. **07**

t-value at d.f.= 9	
α = 5%	α = 1%
2.26	3.25

(b) Mention various point estimation techniques in statistical quality control. **07**
Let p(x, θ) represent probability function of a population with θ as unknown parameter. The likely-hood function of the parameter is defined as follows:

$$L = \prod_{i=1}^{n} \left[p(x_i, \theta) \right]$$

Using the above π-function, find out the maximum likely-hood estimator (MLE) of the mean of a normal distribution N (μ, σ^2) with σ^2 as the known parameter.

OR

Q.3 **(a)** State the applications and limitations of Student's t-test. It is specified that the moisture content of dehydrated tomato powder for export purposes is to be limited to 5% (w.b.). Fifteen samples of tomato powder were drawn up randomly from a large lot produced and subjected to moisture analysis. The average moisture content of these 15 samples was determined as 5.12% (w.b) and its variance as 1.105. Using t-test determine whether the average moisture content of the tomato powder differs significantly from the specified limit of 5% stated above. Comment on α = 5% and 1%. **07**

t-value at d.f.= 14	
α = 5%	α = 1%
2.14	2.98

(b) Describe the properties of a good estimator of population parameters. A random sample of 700 mango puree cans was drawn up randomly from a large consignment ready for shipment. On careful examination 200 cans were found defective in some respect or the other. Calculate (i) 99.73% and (ii) 99% confidence limits for the fraction of defective cans in the consignment. **07**

% Confidence coefficient	t_α
99.73	3
99	2.58

Q.4 **(a)** Highlight Six Sigma quality concept. A company is manufacturing Tomato ketchup. The specification for total soluble solids is in the range of 36 – 40. The process had mean (μ) of 39.2 and standard deviation 0.76. Calculate process capability and process capability index? Comment on the results obtained. **07**

(b) Answer the following questions in brief. **07**

i) Enlist the principles of HACCP.

ii) What do you understand by ISO 9001?

OR

Q.4 **(a)** Explain Integrated TQM model with diagrammatic representation. **07**

(b) Answer the following questions. **07**

(i) What are the benefits of cleaning and sanitation in food industry?

(ii) State precautionary measures to be taken in order to make pest proof food production facility and premises.

Q.5 **(a)** Discuss the role of quality control department in a food industry. Illustrate your answer with examples. **07**

(b) Answer the following questions in brief: **07**

(i) What do you understand by KAIZEN?

(ii) Highlight the role of BIS (Bureau of Indian Standard) in India.

OR

Q.5 **(a)** Discuss the salient features of Food Standards and Safety Act of India 2006. **07**

(b) Answer the following questions: **07**

(i) How can benchmarking help improve an organization?

(ii) Briefly introduce 5'S concept.

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