Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) • EXAMINATION – WINTER 2016

Subject Code:2171401 **Date:18/11/2016**

Subject Name:Food Standards and Quality Assurance

Time:10.30 AM to 1.00 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 Answer the following questions in short:

1	A set of randomly observed values follow Poisson's distribution such that p(2)= p(4), calculate mean, standard deviation of the distribution	1
2	Differentiate between simple and composite hypothesis with an example each.	1
3	Which distribution' Binomial' or 'Normal' has greater degrees of freedom?	1
4	A closed bag contains 20 lemons out which 7 are known to be defective. Three lemons are drawn one by one. What is the probability that all the three are non-defective?	1
5	Define "Dilution Test"	1
6	What is UMVUE?	1
7	State the law of conditional probability.	1
8	What is 'Benchmarking' in relation to quality control?	1
9	What is the difference between a customer and consumer?	1
10	Name some disinfectants. Why is chlorine preferred as a popular disinfectant?	1
11	What is meant by "Misbranding of foods".	1
12	State the importance of Quality Function Deployment.	1
13	What is the mandate of Codex Alimentarius Commission?	1
14	Is BIS certification mandatory for foods? Give examples where it is necessary to obtain BIS certification.	1

Q.2 (a) Define Null Hypothesis. Name the likely errors while formulating a statistical hypothesis. Explain which type of error is considered as more risky in quality control and why? Let $\gamma(h)$ be the probability distribution function of accepting the Null hypothesis H_o when it is true; **03**

Show that $\gamma(h) = 1- \beta(h)$;

where, $\beta(h) = P(x \varepsilon S- \omega \mid h)$ or $P(S- \omega \mid h)$ and $h \varepsilon H$ and ω is the region of sample space S where H_o is rejected. Which function [γ (h) or β (h)] would you endeavor to maximize and how?

(b) What is 'Student t-test'? State the limiting conditions while using this test. Measurement of % tomato solids performed on random samples of two brands of tomato ketchups yielded the following results: **04**

Brand A	26.3	21.4	22.4	24.8	23.6
Brand B	25.8	22.4	29.1	23.5	27.7

Examine the claim at $\alpha = 1\%$ that brand B has higher tomato solids than brand B.
[t = 1.86 at d.f.= 4 and $\alpha = 1\%$]

(c) Define Hedonic Evaluation and comment on its suitability for evaluation of food products. Three test samples A_1, A_2, & A_3 of a soft drink were compared with a control sample (C) of the drink to evaluate the relative overall acceptability of the test samples. A standard 9-point hedonic scale was employed and 12 naïve panelists were engaged for this purpose. The obtained data was tabulated as follows: **7**

Panelist No.	Hedonic Scores			
	Test Sample A_1	Test Sample A_2	Test Sample A_3	Control Sample C
1	3	5	8	3
2	1	4	8	4
3	2	4	4	2
4	2	5	6	3
5	2	4	5	3
6	2	9	5	2
7	2	5	8	2
8	1	5	3	3
9	3	5	5	2
10	4	6	6	3
11	1	5	7	2
12	2	6	6	3

1. Calculate Fiducial Limits w.r.t. control at $\alpha = 5\%$ & 1%
2. Which test sample is superior to control at 5% and 1% significance level?
3. Which test sample(s) is/are inferior to control at 1% significance level?
   (Give logical reasons to support your responses).

t (df = 11 & α = 5%)	2.20
t (df = 11 & α = 1%)	3.11

OR

(c) Explain the following briefly: **07**

(i) Composite scoring test
(ii) Difference between triangle and duo-trio test.
(iii) Affective sensory tests
(iv) r-index
(v) Gustation
(vi) F-test
(vii) Threshold tests

Q.3 **(a)** State and highlight the relevance of ISO 9001:2015 certification for food processing companies. Give tangible advantages such a certification entails. **03**

(b) Write brief notes on the following: **04**

i) Relation between product quality and customer satisfaction.
ii) PDCA cycle

c) Define the following: **07**

(i) Process capability index
(ii) Three sigma concept in food quality and its accuracy.

A manufacturer produces a RTE food product which must have TSS in the range of 30 to 36. Determine process capability and process capability index if the mean TSS and standard deviation are reported as 32 & 2 respectively. Comment on the nature of the process.

OR

Q.3 **(a)** Why does an organization need **03**

(i) A Mission statement
(ii) A Vision" statement

(b) Discuss the following briefly: **04**

i) SQF 1000 certification
ii) Zero defect concept

(c) Enlist and explain important steps to ensure 'Food Safety' during food processing? What is HACCP? Enlist the principles of HACCP and explain the role of GMP to control hazards in a food industry. **07**

Q.4 **(a)** Explain Normal distribution and state its properties. **03**

Establish that P(x) = $\sqrt{\frac{3}{\pi}}\, e^{-3(x-5)^2}$; $-\infty < x < \infty$, represents a Normal distribution function. Calculate its mean, standard deviation and variance.

(b) Explain the following in one/two sentences each: **04**

i) Degrees of freedom
ii) Chi square distribution
iii) Level of significance
iv) Neyman and Pearson *lemma*

c) Explain the mathematical criteria for unbiasedness and consistency of point estimate of a population parameter. A random sample of 700 retorted cans of mango puree was drawn from a large consignment. Out of these 140 were found damaged. Determine 95% & 99 % confidence limits for the proportion of damaged cans in the consignment. **07**

α	Critical value of statistic
5%	1.96
1%	2.58

OR

Q.4 **(a)** Explain the significance of normal distribution in quality control. A certain quality control operation is represented by a distribution given by **03**

$$p(x) = \frac{1}{3\sqrt{\pi}}\, e^{\frac{-(x-10)^2}{18}} \quad ; \quad -\infty < x < \infty$$

i) Examine if it is a normal distribution.
ii) Calculate the mean, variance and standard deviation of the distribution.

(b) State the criteria for a good estimator and explain the mathematical criteria for sufficiency of an estimate. If X_1 , X_2 and X_3 constitute a random sample of size 3 from a normal population with mean μ and standard deviation σ, calculate the efficiency of the statistic $t_1 = \frac{0.5X_1 + X_2 + 2X_3}{3}$ relative to $t_2 = \frac{X_1 + X_2 + X_3}{3}$. **04**

c) Define regression and differentiate between simple and multiple regressions. For a given data set of 35 observations of two variables (x,y), the following mathematical summary is available: **07**

$\bar{x} = 0.42$, $\bar{y} = 8.1$, $\sum\left(y-\bar{y}\right)^2 = 45$, $\sum\left(x-\bar{x}\right)^2 = 0.2$, $\sum\left(y-\bar{y}\right)\left(x-\bar{x}\right) = 1$

Determine the approximate linear relationship between x and y and calculate the coefficient of correlation. Examine if there is significant relationship between x and y. Given that the critical value of r (at $\alpha = 5\%$ and df = 33) is 0.35.

Q.5 **(a)** Define quality audit and state its purpose. Classify different types of audit? **03**

(b) What are the basic considerations for food safety & consumer protection in today's times? Give a concise design layout of a QA Lab suitable for processed food industry. **04**

c) Why is customer satisfaction so important? Explain the improved customer satisfaction model with a neat diagrammatic construct. State some practical ways to improve customer satisfaction for FMCG sector. **07**

OR

Q.5 **(a)** What commodities are covered under AGMARK certification? Who is implementing the provisions of this Act and the Rules? How AGMARK standards assist in choosing a quality food product? **03**

(b) Discuss briefly: **04**

(i) FSSAI
(ii) SWOT analysis?

c) Define TQM and state its principles. Explain the TQM Transition model with the help of a neat diagram. **07**

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