Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2171401 **Date:10/05/2019**

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 briefly: **03**

i. Define gustation
ii. Calculate the degrees of freedom Poisson's distribution.
iii. Define α and β risk

(b) Match the entities of Column-I with most appropriate entities of Column-II. **04**

S.No.	Column-I	Column-II
1.	Simple hypothesis is	Prof. R.A Fisher
2.	Addition law of probability	Consistent
3.	Olafaction	Product difference
4.	Theory of Estimation	Smell
5.	Triangle test	Reject hypothesis
6.	Sufficient estimator is	H: {$\mu = 6$ & $\sigma^2 = 16$}
7.	Critical region	Mutually exclusive events
8.	Normal distribution	d.f. = 2

(c) What are seven principles of HACCP? Discuss each one with its importance. **07**

Q.2 **(a)** Define Null Hypothesis. Explain the possible errors during testing of a statistical hypothesis. Explain which type of error is considered as more risky in quality control and why? **03**

(b) What is critical region? Let γ(h) be the probability distribution function of accepting the Null hypothesis H_o when it is true; **04**

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

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

(c) 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 weekly sales data for a newly launched snack food in a metropolitan city at five locations (L1, L2,L3,L4 and L5) is given below:

City	L1	L 2	L 3	L 4	L 5
Expected sales in units/week	165	175	118	185	85
Observed sales in units/week	152	184	100	170	78

(i) What is the actual mean daily sale of the product?
(ii) Are observed and expected sales in significant agreement with each other? Comment logically at 5% significance level.

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

OR

(c) Define Hedonic Evaluation. Three test samples S_1, S_2, & S_3 of a soft drink were compared with a market control sample (C) of the same type to ascertain the relative overall acceptability. A standard 9-point hedonic scale was employed and 12 untrained panelists were engaged. The obtained data is given below: **07**

Panelists	Test Sample S_1	Test Sample S_2	Test Sample S_3	Control Sample C
1	1	6	4	4
2	2	7	4	3
3	3	4	5	2
4	1	7	5	3
5	2	7	4	2
6	2	5	8	3
7	2	5	6	3
8	2	3	5	2
9	3	5	5	2
10	1	8	6	3
11	4	8	6	1
12	2	6	5	4

1. Determine Fiducial Limits for the control sample at α = 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?

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

Give reasons for your answers.

Q.3 **(a)** The standard plate count in a canned fruit pulp is to be limited to 15 after 9-months under normal storage conditions at NTP. After 9-months, 10 samples were randomly picked up from a large population and their SPC was estimated in lab. The mean SPC of the 10 samples was calculated as 16 and variance was 1.2544. Name and perform a suitable statistical test to demonstrate if the estimated SPC is in agreement with the specified limit. Comment on α = 5% and 1%. **03**

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

(b) How will you characterize normal distribution? State its application in quality control? Examine the following probability distribution function: **04**

$$g(x) = \alpha e^{\frac{(3-x)^2}{50}}, \quad -\infty < x < +\infty$$

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

(c) State the conditions of good estimators of a point estimate? Explain the criteria for efficiency and sufficiency of point estimate of a population parameter? A random sample of 650 bottles of strawberry squash was drawn from a large consignment meant for export. Out of these 170 were found infected beyond the specified limits. Determine 95% & 99 % confidence limits for the proportion of infected cans in the consignment. **07**

Level of significance (α)	Critical value of statistic
1%	2.58
5%	1.96

OR

Q.3 **(a)** Define Normal distribution. **03**

Plot the distribution $f(x) = \frac{1}{\sqrt{18\pi}} e^{-\frac{(x-10)^2}{18}}$ for $-\infty < x < \infty$ and demonstrate that it represents probability distribution function of a Normal distribution. Calculate its mean and variance.

(b) State the limiting conditions in applying 'Student t-test'. The sales data of a RTD beverage from five different points of sale before and after a promotional campaign are given below: **04**

Points of Sale	I	II	III	IV	V
Sales before	106	56	62	96	100
Sales after	116	58	60	110	112

Examine if the promotional campaign be termed as effective at $\alpha = 1\%$
[$t = 1.86$ at d.f.$= 4$ and $\alpha = 1\%$]

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

(i) Regression analysis
(ii) Unbiased estimator
(iii) Dilution test
(iv) Composite scoring test
(v) UMVUE
(vi) Law of conditional probability
(vii) ANOVA technique

Q.4 **(a)** Differentiate between Yesteryear's and Today's Quality Era. **03**

(b) Briefly explain strategic grid and SWOT Analysis. **04**

(c) Define Quality control and Quality Assurance. Discuss the interface of Quality control department with other departments in a food industry. **07**

OR

Q.4 **(a)** Define the following terms: **03**
i) Benchmarking
ii) Rubber Bondage
iii) Surveillance Audit

(b) How value addition can change customer's satisfaction level? **04**

(c) Explain Transition TQM Model with its diagrammatic representation. **07**

Q.5 **(a)** What do you understand by Good Manufacturing Practices? **03**

(b) Highlight on the followings. **04**
i) American Public Health Association (APHA)
ii) Bureau of Indian Standards (BIS)

(c) Enlist clauses of ISO 9001:2015 standard. What are benefits of Quality Management System? **07**

OR

Q.5 **(a)** Introduce briefly FSSAI and its mandate. **03**

(b) What is a six sigma accuracy? How the process can be characterized with Cp and Cpk value? **04**

(c) Discuss the drivers for quality initiatives in today's scenario. **07**

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