(140) SARDAR PATEL UNIVERSITY
M.Sc.Semester-III: Analytical Chemistry Examination (CBCS)
November-2019, Date: 20.11.2019
Wednesday, Time: 2.00 p.m. to 5.00 p.m.
Paper: PS03CANC22
Subject: Elements of Analytical Chemistry, Total Marks: 70

N.B.: i) Figures to the right indicate marks.
ii) Assume the suitable data if necessary and indicate the same clearly

Q.1 Attempt with the right answer highlighted [08]

i) Analytical sensitivity is...
   a) A measure of error
   b) A modified form of precision
   c) Independent of magnitude
   d) Both b) and c) are correct

ii) A bias Δ is a measure of ....
   a) Precision
   b) Random error
   c) Systematic error
   d) Accuracy

iii) A typical laboratory recorder is an example of a_____
   a) Filter
   b) Battery
   c) Servo system
   d) Transistor

iv) Which of the flowing is/are instrument readout unit(s)?
   a) LDC
   b) LCD
   c) LED
   d) Both (b) and (c)

v) Which of the following is not responsible for dispersion?
   a) Sample volume
   b) Length of tube
   c) Temperature of tube
   d) Flow rate

vi) Automatic elemental analyzer performs the procedure(s) like
   a) Chromatography
   b) Measuring thermal conductivity
   c) Combustion
   d) All

vii) If $\sum(x_i-mean)^2$ and 'SD' of a measurement were calculated to be 20×10^{-2} and 0.2 respectively, number of observations will be
   a) 2
   b) 5
   c) 6
   d) None

viii) If the coefficient of variation is expressed by (A/B)C then..
   a) A=SD, B=Mean, C=100
   b) A = Mean, B=SD, C=100
   c) A = Mean, B=100, C=SD
   d) A=SD, B=Mean, C=1000

Q.2 a) Attempt only **SEVEN** [14]

i) Explain the 'random error' and 'precision'.
ii) Illustrate the 'proportional error situation'.
iii) Discuss the power supplies, used in electrical devices.
iv) Give a brief introduction of microprocessors and microcomputers.
v) How SIA is better than FIA? Explain
vi) *Analyst-1* and *Analyst-2* report SDs 2.19 and 2.89 respectively, of their separate copper determinations in a sample. Ascertain whether there is significant difference in SDs by pairs of analysts, using F-critical value 4.95.
vii) Discuss the stopped-flow measurement in automated system.
viii) State the term 'confidence interval' and its significance.
ix) State the term 'robustness of the method'.

(1)   (P.T.O)

Q.3 **a)** Explain the sensitivity of analytical instrument. Discuss analytical and calibration sensitivity. Explain how it is different from the selectivity. [06]

b) Answer the following [06]
i) What is the dynamic range of instrumental method? Explain its significance.
ii) Discus the performance characteristics of instruments.

OR

b) Give the detail note on classification of analytical techniques. Explain the comparison of instrumental methods.

Q.4 **a)** Give a detailed account on data domain map. Illustrate analog, digital and time domains. [06]

b) Outline the following [06]
i) The 'p' and 'n' type material characteristics and function of p-n junction.
ii) Transducers.

OR

b) Discus the application of computers in analytical instruments. Explain off-line, on-line, in-line and intra-line computer conjugations.

Q.5 **a)** Give the merits and demerits of automation. State in brief unit operations associated with the automation strategy. [06]

b) Describe the following [06]
i) STAC and laboratory robotic.
ii) Centrifugal analyzer.

OR

b) Discuss the dispersion and flow injection analysis.

Q.6 **a)** Discuss the frequency polygon and histogram. Discuss the information retrievable. [06]

b) Outline the following [06]
i) Student t-test.
ii) Verifying methods and ruggedness test.

OR

b) A chemist reported 0.084, 0.089 and 0.079 as % ages of alcohol content in blood, running three different samples. Calculate 95% Confidence Interval of mean assuming (a) the three results obtained are only indication of the precision of method, and (b) from previous experience on hundreds of samples, we know that SD of the method = 0.005% alcohol and is good estimate of σ. [use value of $t = 4.30$; $z = 1.96$]

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