বাংলাদেশ ইউনিভার্সিটি অব প্রফেশনালস্

সেকশন/গ্রুপ B (Section-B)

ইনভিজিলেটরের স্বাক্ষর

মোট পৃষ্ঠা সংখ্যা 11 টি

BSc. in CSE-17, Final Exam (Fall) Dec-20 পরীক্ষা(Examination), 20 20

বিষয় (Subj): Applied Statistics and Queuing Theory পত্র/কোর্স নং (Paper/Course No): CSE-407

পত্র/কোর্সের নাম (Paper/Course Name): CSE-17 কেন্দ্র (Center): MIST

রেজিঃ নম্বর (Regn No): 1314011700018 শিক্ষাবর্ষ (Session): 2019-2020

রোল নম্বর (Roll No): 2017140018 তারিখ (Date): 23-12-2020

INSTRUCTIONS FOR EXAMINEE

1. Examinees are forbidden to write their names either on outer cover page or anywhere of the answer scripts. In case of violation, the answer script will not be evaluated.
2. Examinees must mention their roll and registration number along with session on the outer cover page of the answer scripts clearly. Otherwise, answer scripts may not be evaluated.
3. Students will write his examination roll number on the top left corner and section-A/B on the top right corner of each page. All pages must be numbered chronologically at the bottom center in x of y format. (for example: 1 of 21)
4. All rough works should be done in the same paper used as answer scripts. Answer scripts should be submitted intact. Papers used for rough work should be pen through by the examinees.
5. In no case, an examinee will be allowed to start the examination half an hour after the commencement of examination.
6. Examinees must abide by the instructions of chief invigilator if there are no definite instructions on any subject/matter.
7. No examinee will be allowed to leave the examination session until an hour has elapsed from the commencement of examination.
8. Legal action will be taken against the examinees those are caught for copying and found guilty for any breach of discipline as per rule.

পরীক্ষক কর্তৃক পূরণীয়

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নিরীক্ষকের স্বাক্ষর

Continued

INSTRUCTIONS FOR EXAMINEE

9. Smoking is strictly prohibited during examination.

10. The Camera of the examinee MUST always be ON during the examination and answer script submission. If Camera is OFF then that online examination will be treated as CANCELLED.

11. The answer scripts submitted beyond specified time will be treated as CANCELLED.

12. The examinee has to share his/her computer screen to the invigilator throughout the examination time.

13. The focus of the camera should be such that the invigilator(s) can see the script and examinee with his/her surroundings.

14. The examinee will send his/her scanned examination script in PDF format to the following e-mail addresses:

(a) e-mail address of subject invigilator/examiner.

(b) Central Database Scheme (coursecode@mist.ac.bd)

Example: EECE433@mist.ac.bd

15. The examinee has to preserve the original answer script of every examination and be ready to submit whenever asked for.

16. Answer script should be the A4 size papers with a cover page provided by Department. Examinee has to fill up his/her necessary details on the cover page. Section A and section B must be clearly marked on the cover page like. **Section A** or **Section B**

17. Examination duration for each subject will be two hours (section-A for one hour + section B for One hour). In between students will get 20 minutes time to submit the answer script of section A and 10 minutes time to issue the question for section B . After completion of 01 hour examination time for section B, students will get 20 minutes to submit the answer script of section B.

18. After completion of written examination (online/physical), viva will be conducted by the respective faculty of that subject.

Section-B

Ans. to the ques. no.-05(a)

The statistical investigative cycle (PPDAC) is drawn below:

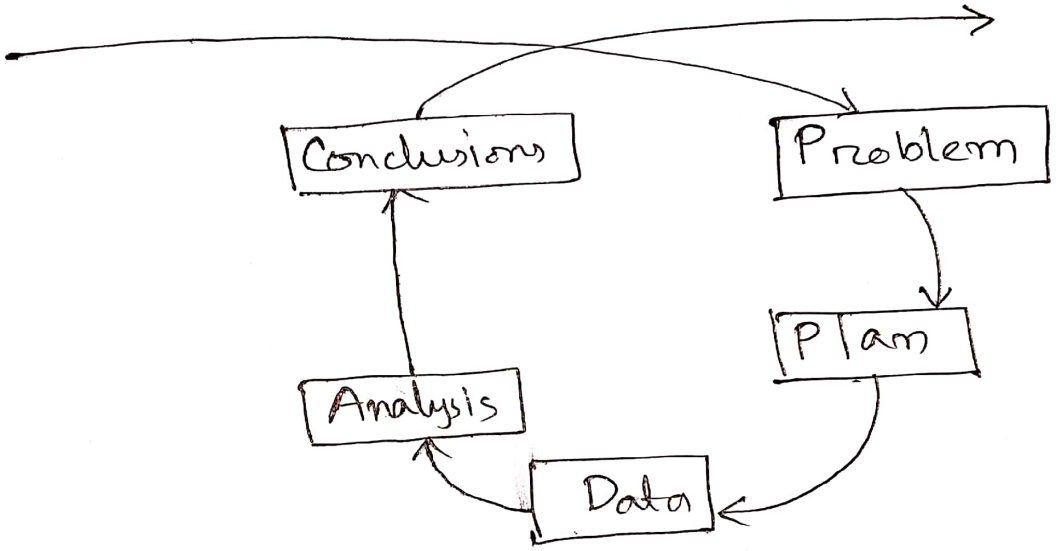

Fig: Statistical investigative cycle.

Problem:

Problem of a statictical job is defined and documented.

Plan:

How to solve or what way the data can be organized is done and planned.

Data:

Data cleaning, Data management are done.

P.T.O.

Analysis:

~~Sat~~ Statistical Analysis, Hypothesis testing etc are actully done here.

Conclusion:

Conclude the statistical data interpretation and presenting them.

In the, Analysis part of the PPDAC cycle is used for most of the applied statistics tasks. since, in the Analysis the tasks are properly handled with appropriate calculations, hypothesis testing, p-value methods and all other tasks are handled in the Analysis part of PPDAC - So, Analysis is the part where Applied statistics is used for most tasks.

Ans. to the ques. no.- 05(b)

Errors may exist in hypothesis testing because:

① Ideal conditions may not be met.

② There might be some hidden variable or parameter that gives wrong results.

③ No experiment or trial is perfect.

Two types of ~~by~~ errors in hypothesis testing are:

① Type-I error: when we reject the Null hypothesis(H_0) when, it is, infact True.

example: An Innocent Person but we reject him as loyal (severe more!).

② Type-II error: when we accept the Null hypothesis(H_0) when it is, infact false.

example: A Thief (non-Innocent) Person but we accept him as loyal.

Ans. to the ques. no. - 05(c)

As a data analyst or researcher, we have to choose α (Level of significance). α is completly upto data analyst. Now, Type-I error is also ~~the~~ equal to α. Because the probability of making Type-I error is also the same α. So, As a ~~data~~ analyst, Type-I error directly depends on my choice.

For smaller size datasets, sample α should be ~~higher~~ smaller and c should be higher. Because if c is higher then the region of acceptance will be wider. (No need to be too rigid for small sample). So, α should be smaller for small sample sizes. (lower)

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Ans. to the ques. no.-05(d)

Here,

Null hypothesis, $H_0 : \mu \geq 99.18$ (my Id = 18) (2017140 18)

Alternate hypothesis, $H_1 : \mu < 99.18$

$n = 50 + Y = 50 + 18 = 68$

$\bar{X} = 98.50$

$s = 3.8$

[:All percentages are omitted]

$\alpha = 1 - C = 1 - 0.95 = 0.05$

since, $H_1 : \mu < 99.18$ it is one tailed test (left-tailed test).

Since, $n = 68 (\neq 100)$ and also population std. deviation is unknown we will use t-table.

Critical value for $\alpha = 0.05$ from t-table we get = ~~1.675~~ ($t_{0.05}$, ~~df = 80 or 67~~) df between df = 80 and df = 60 because for us df = 67)

P.T.O.

Now,

$$z = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{98.50 - 99.18}{3.8/\sqrt{68}}$$

$$= -1.48$$

So,

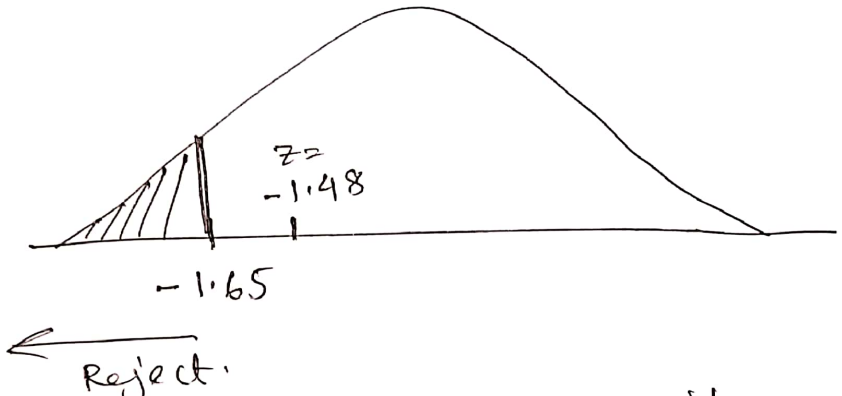


fig: Left Tail

Sin, z belongs on the accepted region.

So, we fail to reject the Null hypothesis (Ho) with 95% confidence.

Here, 99.18 is currently claimed so, it is Ho and we could not gather enough sample to reject that Ho.

We know,

Power of test $\beta = 1 - \beta$.

critical value = -1.65

and $\bar{x} = \mu + \frac{s}{\sqrt{n}} z$ $= 99.18 + \frac{3.8}{\sqrt{68}}(-1.65)$

$= 98.42$

P.T.O.

$$P(\bar{x} > 98.42 \mid \mu = 99.25)$$

$$= P\left(z > \frac{\bar{x} - \mu}{s/\sqrt{n}} \mid \mu = 99.25\right)$$

$$\Rightarrow P\left(z > \frac{98.42 - 99.25}{3.8/\sqrt{68}}\right)$$

$$\Rightarrow P(z > -1.80) = 0.0359$$

$$\beta = 0.0359$$

So, power of test $= 1 - \beta$

$$= 0.9641$$

Ans

Ans. to the ques. no.-06(a)

P-value in applied statistics =

(1) Probability of H_1 happening +

(2) Probability of something rarer as H_1 happening +

(3) Probability of something even rarer than H_1 happening.

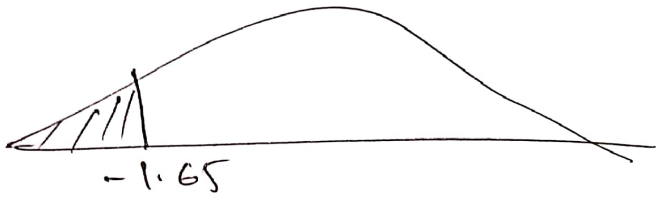
where, ~~H_0 = Null hypothesis~~.

H_1 = Alternate hypothesis.

P-values finds the rare of H_1 happening which helps to find the probability of H_0 happening in terms of a threshold.

Ans. to the ques. no. - 06 (b)

We know from 5(d) that critical z value = -1.48 and it is so, a left-tailed test.



So,
P-value = ~~0.0495~~ 0.0694 (for ~~-1.65~~)

So, P-value = 0.0495.

P-value = 0.0694 (for z = -1.48)

∴ So, P-value = 0.0694

Since, 0.0694 > 0.05

So,
we fail to reject H_0.

Ans. to the ques. no.-06(c)

Confidence intervals gives us a range that is more justified and logical and can not be used against any further. So, confidence intervals are better than P-value method.

Though P-value helps to get us the worst case scenario which can also be tackled in confidence interval if sample space is bigger.

Ans. to the ques. no. 06 (d)

Confidence interval for the 95% or C = 0.95 so, $\alpha = 0.05$ so, $\alpha/2 = 0.025$.

So,

~~$C.I = \bar{X} \pm Z_{\alpha/2}$~~

$$C.I = \bar{X} \pm t_{(\alpha/2, 9)} \frac{s}{\sqrt{10}}$$

$$\bar{X} = \frac{4.5+7+8.5+10+11+5.6+6.5+7.6+5.9+8.8}{10}$$

$$= 7.54$$

$$s = 2.044 = \sqrt{\frac{\Sigma(X_i - X_{avg})^2}{n-1}} = 2.044$$

So,

$$CI_{98\%} = 7.54 \pm 2.262 \times \frac{2.044}{\sqrt{10}}$$

$$= 7.54 \pm 1.462$$

So, (6.078, 9.002) for 95%