COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

NMMS204: QUANTITATIVE METHODS 2

END OF SECOND SEMESTER EXAMINATIONS

APRIL 2022

LECTURER: TARAMBAWAMWE P

DURATION: 3 HOURS

INSTRUCTIONS

Section A is compulsory.

Select one question from section B

Credit will be awarded for logical, systematic and neat presentations

SECTION A [COMPULSORY]

QUESTION ONE

(a) i. What is the 10^{th} term in the GP 4, 3.6, . . .? [3]

ii.Find the sum of the terms in the GP 4, 3.6, ?[5]

(b) A ball is dropped from a height of 10 metres onto a hard floor and bounces. After each bounce, the maximum height reached by the ball is 50% of the previous maximum height. What is the total distance travelled by the ball from the time it was first dropped until it eventually comes to rest on the floor[5 marks]

(c) i. How many different committees of 5 can be formed from 3 men and 3 women ?[2]

ii. Rudo has 4 friends. In how many ways can he invite one or more of them at a dinner if Chido has to be there all the time.[5]

iii Find the number of ways in which a team of 7 players can be selected from 20 players including 3 of them and excluding 5 of them [5]

SECTION B [CHOOSE ONE QUESTION]

QUESTION TWO

I got the quarterly figures of salesmen's performance through yesterday and I thought I'd see if there is any connection between how far they travel and how many sales they make, so I put them through our computer package that does correlations, but I can't make sense of the bits at all- could you interpret, please.'

The information enclosed with the memo is as follows:

Salesman	**Mileage(km)**	**No. of Sales**	**Time with Company(Months)**
Smith	256	27	32
Adams	462	8	6
Williams	322	34	36
Green	211	25	28
Murphy	153	18	8
Evans	186	23	12
Newton	372	38	50
Sam	223	19	12

(i) Find the spearman correlation coefficient of mileage with the company and number of sales [8]

(ii) Find the regression equation for number of sales and the time with company in the form Y = a + bX. [8]

(iii) Write notes to guide you in explaining to the sales manager what the information in (i) and (ii) means, and how it should be interpreted in the light of the data. [6]

(iv) Calculate the coefficient of determination of mileage with the company and number of sales and interpret it.[3]

QUESTION THREE

a.

i. Construct the network for the following project, number the nodes, starting at one. [5]

Activities:
AM is the first activity in the project
BN starts when A is complete
CO follows BN
DP starts at the same time as BN
EQ follows all other jobs.

ii. Using the following activity timings, add the EST and LFT for each node and determine the critical path for this project. [10]

Activity	AM	BN	CO	DP	EQ
Duration (days)	3	4	2	1	3

b. In your construction project, there are five activities left; Activity A has a duration of 2 weeks and it is the finish-to-start predecessor of Activities B, C and D. Activity B will take 1 week to complete, Activity C has a duration of 2 weeks and Activity D is 3 week long. On the other hand, Activity E is dependent upon de completion of activities B, C and D. Which activities are the critical path? [10]

END OF EXAMINATION

LIST OF FORMULAE

Sturge's Rule:

Number of class, $C = 1 + 3.3\log n$

Class width, $i > \frac{range}{C}$

Regression and Correlation

$b = \frac{n\sum xy - \sum x\sum y}{n\sum x^2 - (\sum x)^2}$ $a = \frac{\sum y - b\sum x}{n}$

Pearson Correlation Coefficient

$$r = \frac{n\sum xy - \sum x \cdot \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2}}$$

Spearman's Rank Coefficient

$$r = 1 - \frac{6\sum D^2}{n(n^2-1)}$$

Time series

$b = \frac{n\sum xy - \sum x\sum y}{n\sum x^2 - (\sum x)^2}$ $a = \frac{\sum y - b\sum x}{n}$

Financial Mathematics

AP: $T_n = a_1 + (n-1)d$

$S_n = \frac{1}{2}n[2a + (n-1)d]$

GP: $T_n = ar^{n-1}$

$S_n = a(1-r^n)/(1-r)$

Index Numbers

$I_l = (\sum p_t.q_0)/(\sum p_0.q_0)$

$I_p = (\sum p_t.q_t)/(\sum p_0.q_t)$

8. Coefficient of skewness: $S_k = \dfrac{3(mean - median)}{s} = \dfrac{mean - \text{mode}}{s}$

12. Test statistic: $t = \dfrac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$ or $Z = \dfrac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$

13. Proportion Test Statistics = $Z = \dfrac{\hat{p} - p}{\sqrt{pq/n}}$

14. $\square = \dfrac{\square - \square}{\square}$

16. CV = $\dfrac{\square}{\square} \times 100$

17. $\hat{p} - z_{\alpha/2}\sqrt{\dfrac{\hat{p}\hat{q}}{n}} < p < \hat{p} + z_{\alpha/2}\sqrt{\dfrac{\hat{p}\hat{q}}{n}}$

18. $E(X) = \sum X.P(x)$

19. $\sigma = \sqrt{\sum x^2 P(x) - \mu^2}$

20. $\bar{X} - z_{\alpha/2}\left(\dfrac{\sigma}{\sqrt{n}}\right) < \mu < \bar{X} + z_{\alpha/2}\left(\dfrac{\sigma}{\sqrt{n}}\right)$

21. $z = \dfrac{\left(\bar{X}_1 - \bar{X}_2\right) - \left(\mu_1 - \mu_2\right)}{\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}}$ or $t = \dfrac{\left(\bar{X}_1 - \bar{X}_2\right) - \left(\mu_1 - \mu_2\right)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$

22. $\left(\bar{X}_1 - \bar{X}_2\right) - z_{\alpha/2}\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}} < \left(\mu_1 - \mu_2\right) < \left(\bar{X}_1 - \bar{X}_2\right) + z_{\alpha/2}\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$

23. $t = \dfrac{\bar{D} - \mu_D}{s_D / \sqrt{n}}$

24. $$z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\bar{p}\bar{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

where

$$\bar{p} = \frac{X_1 + X_2}{n_1 + n_2} \qquad \hat{p}_1 = \frac{X_1}{n_1}$$

$$\bar{q} = 1 - \bar{p} \qquad \hat{p}_2 = \frac{X_2}{n_2}$$