30/11/2018

ME Civil Sem I / Choice base / Second half 2018

Exm

(3 hours)   [Total Marks-80]

N.B. (1) Attempt any four questions out of six questions
      (2) Assume any additional data if necessary and state it clearly
      (3) Figures to the right indicate full marks

1 a) Trains X and Y arrive at a station at random between 7 am and 7.40 am. Train X stops   [06]
        for 5 minutes and Train Y stops for 4 minutes. Assuming that both trains arrive
        independently of each other, what is the probability that
        i.   Train X arrives before Train Y
        ii.   The trains meet at the station
        iii. Assuming that the trains meet, Train X arrived before Train Y

   b) Determine Spearman's rank correlation coefficient based on the following data. Also   [08]
        interpret the same.

Items	Points given by quality manager	Points given by sr. site engineer
Excavation	9	8
PCC	10	8
RCC	6	7
Plumbing	10	7
Plastering	6	5
Waterproofing	7	8
Woodwork	4	5
Electrification	7	7
Brickwork	7	6
Water tank	8	9

   c) The bricks supplied to a particular construction site in Kalyan come from the 5 different   [06]
        brick manufacturing kilns located in the vicinity. After investigation, it was observed
        that Kiln 1 manufactures 5000 bricks at a time, of which 20% are defective. Kiln 2
        manufactures 8000 bricks of which 5% are defective. Kiln 3&4 manufacture 7000 bricks
        each of which 15% are defective. Kiln 5 manufactures 4000 bricks, of which 12 % are
        defective. If, during random inspection, one Kiln is selected, and one brick is drawn at
        random from that kiln, what is the probability that the selected brick is defective?

2 a) Explain the utility of Vorster-Sears model with respect to equipment downtime. Also   [10]
        explain the application of Failure Cost Profile

   b) A tenderer is bidding for construction works, averagely 15 nos. in a year for the past 5   [10]
        years. Find the probability that:

        i.   He gets atleast 14 works
        ii.   He gets exactly 7 works
        iii. He does not get any work
        iv.   He does not get more than 2 work
        v.   He gets all the works

        Also find the mean, standard deviation, variance and frequency of 'r' successes of the
        above scenario

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3. a) Explain Griffi's mathematical model with a construction example [10]

   b) In 15 years of a truck driver's career, it has been recorded that he has encountered 23 minor and 2 major accidents. His average journey is 50 kms/day. What is the probability that, if he has embarked on a journey to deliver goods on a construction site, 25 kms from the manufacturing yard, that he will be involved in an accident

4. a) Table below gives the properties of 10 concrete mix batches used for construction on site. [12]

Data pertaining to a sample of 10 concrete mixes used for construction

Sr. No.	Cement content (X) (kg/m³)	W/C ratio (Y)	Compressive strength (Z) (N/mm²)
1	355	0.463	38.4
2	357	0.461	39.1
3	361	0.456	40.7
4	358	0.460	39.2
5	365	0.451	42.1
6	368	0.446	46.3
7	347	0.469	35.5
8	359	0.459	39.9
9	361	0.455	41.4
10	366	0.444	47.8

Find out the Karl-Pearsons Simple co-relation coefficient that exists between:
   i.   Cement Content(X) and Compressive strength (Z)
   ii. W/C ratio(Y) and Compressive strength (Z)
Also check for probable error and find coefficient of determination. Comment on the physical significance of C.D obtained

   b) Develop Regression equations between the 3 parameters given in question 4 a) [08]

5. You are the materials manager of a very reputed construction company. On a prestigious [16] construction project, it is estimated that your company requires certain cement bags for 8 months. Basic Unit price of cement bags is Rs. 340/bag. The ordering cost is Rs. 3000/order. Inventory Carrying cost is 22% of average annual inventory. Based on activity scheduling, monthly requirement is as follows:

Monthly estimated requirement

Sr. No.	Month	No. of bags required (in thousand)
1	Jan	25
2	Feb	26
3	Mar	20
4	Apr	23
5	May	21
6	Jun	15
7	Jul	7
8	Aug	4

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Suppliers have offered discounts on bulk purchases as follows.

Discounts offered

Sr. No.	No. of bags	Discount (%)
1	50,000 and above	10
2	30,000 to 49,999	7
3	20,000 to 29,999	5
4	10,000 to 19,999	3
5	5,000 to 9,999	2
6	Below 5,000	No discount

A research related to godown management has revealed that cement deteriorates after 3 months and hence is not suitable for the intended use. Also it is found that there have been thefts associated with over-storage. The overstocking cost for the above scenario were linked up with the period of cement remaining idle as follows:

Depreciation of cement

Sr. No.	1	2	3	4
Period	3 months and less	3 to 4 months	4 to 5 months	5 months and above
Depreciation	4 % of unit price	9 % of unit price	15% of unit price	22% of unit price

Another research associated with work stoppages and production delays was carried out and understocking cost was carried out and understocking cost can be considered equivalent to 10% of the cost of total cement bags causing the understocking. Decide the order quantity to be purchased, based on uniform ordering period, so that the total cost of cement bags is minimum

5 b) If 0.5% of door handles manufactured by a factory are defective, find the probability that in a batch of 1000 such handles manufactured   [04]
    i.   15 handles are defective
    ii.   10 handles are defective
    iii.   25 handles are defective

6. a) A sample of 100 arrivals of automobiles at a toll booth is found to be according following distribution.   [12]

Time of Arrivals in minutes	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Frequency	2	6	10	24	20	15	10	7	4	2

A study of service time reveals the following distribution

Service time in minutes	0.5	1.0	1.5	2.0	2.5
Frequency	13	22	37	20	8

Estimate the average waiting time, percentage waiting time of the vehicle, average idle time and percentage idle time of the server for 10 arrivals. Use the following Random No.

Arrivals	16	77	23	02	77	28	06	24	25	93
Service time	56	65	05	61	86	90	92	10	79	82

b) With practical examples explain the various quality control tools.   [08]

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