

ME CIVIL | sem I | CBCS | FH2019

24/05/19
[Total Marks-80]

(3 hours)

- N.B. (1) Attempt any four questions out of six questions
(2) Assume any additional data if necessary and state it clearly
(3) Explain answers with neat sketches wherever necessary

1. a) Given the following data, related purchase and sales, obtain two regression equations by the method of least squares and estimate the likely when purchase equal to 120 [06]

Purchase(x)	60	75	100	80	85	55	77	90	87	50
Sales (y)	110	125	132	120	135	98	128	140	98	85

- b) A Contractor has kept the data regards the delays and penalties on his previous 10 construction projects, as below: [14]

Project	1	2	3	4	5	6	7	8	9	10
Delay (in days)	40	5	30	80	15	95	10	100	25	50
Penalty (in lac Rs.)	15	3	10	25	6	50	5	35	25	32

Use Monte Carlo simulation, Simulate the mean delay and mean penalty which the contractor should consider for 5 of his future projects. Generate the random numbers form the numbers given below

Pseudo-Random Numbers

52	61	22	34	32	88	44	56	23	98	36
39	45	68	21	42	13	91	40	12	42	61
08	53	18	01	71	64	80	28	49	51	39
24	24	95	38	72	93	58	74	09	34	74
50	51	24	84	43	38	13	90	76	81	69

2. a) Explain application of Cox Model, Nunally and Vorster-Sears models in predicting and controlling construction equipment breakdown costs with practical examples [08]
 b) If 2% of windows manufactured by a factory are defective, find the probability that in a batch of 1000 doors delivered to a residential construction site [06]
 (i) no door is defective (iii) 2 doors are defective
 (ii) 5 doors are defective (iv) 10 doors are defective
 c) In a catchment, the annual rainfall is estimated to be normally distributed with a mean of 150 cm. and a standard deviation of 38 cm. What is the probability that the annual rainfall [06]
 (i) is 100 to 170 cm (ii) is atleast 75 cm
3. a) Explain with example the utility of Spearman's Rank Correlation coefficient in HRM [06]
 b) In 28 years of a truck driver's career, it has been recorded that he has encountered 33 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 a minor accident? [06]

- c) A tenderer is bidding for construction works, averagely 20 nos. in a year for the past 5 years. [08]
Find the probability that:
- (i) He gets atleast 18 works (ii) He gets exactly 3 works
(iii) He does not get any work (iv) He does not get more than 2 works
(v) He gets all the works

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

4. a) For the construction of a fence, the contractor used concrete which was desired to be M35. [12]
The following compressive strengths in N/mm^2 were recorded for each batch

Batch no.	Comp. strength(N/mm^2)
1	32.5
2	31.2
3	27.3
4	34.5
5	37.5
6	37.3
7	31.2
8	31.4
9	30.3
10	35.6

You are the quality control in-charge from the client's side. Based on the above data and our assumed benchmark, decide whether you will accept or reject the concrete work. Also suggest some recommendations to the contractor for improving the concrete quality.

- b) Four machines regularly produce similar products on an automated production line. Machine 1, which manufactures 10% of the products, produces a defective product 1 times in 15; Machine 2, which manufactures 60% of the products, produces a defective product 1 times in 20; Machine 3, which manufactures 15% of the products, produces a defective product 1 times in 12. Machine 4, which also manufactures 15% of the products, produces a defective product 1 times in 10; If, during random inspection, one product is selected at random, what is the probability that the selected product is defective? Also find the probability, if the product is defective, what is the probability that it has come from Machine 3? [08]
5. a) For a particular project, it was estimated that 1 lakh cement bags would be required. The ordering cost is Rs. 2500/- per order. The unit cost of cement bag was estimated Rs. 320/- Inventory carrying cost is 20% of the average annual inventory. During the project, it was found that only 1,05,000 bags were required. Also, the cost of cement bags increased to Rs. 350/- The ordering cost increased by Rs. 500/-, whereas the inventory carrying cost remains as it is. Find out how much % increase or decrease in cost would be incurred due to variation. [06]

- b) Table below gives the weights of various contents in 10 concrete mixes used for construction on site [14]

Sr. No.	Cement content (X) (kg/m ³)	W/C ratio (Y)	Compressive strength (Z) (N/mm ²)
1	345	0.457	34.7
2	325	0.446	35.0
3	327	0.443	36.3
4	341	0.455	33.5
5	349	0.463	29.9
6	332	0.440	38.4
7	356	0.448	36.8
8	328	0.439	37.4
9	354	0.451	34.9
10	347	0.443	36.7

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

6. a) You are project manager on construction project. Your project required 1 lakh cement bags annul. Basic unit price of cement bag inclusive of taxes, handling, and transportation to project site location is Rs. 300/bag. The ordering cost is Rs. 2000/order. Inventory carrying cost is 20% of average annual inventory. Based on activities scheduling monthly required cement bags are as follows. [08]

Months	Jan	Feb	Mar	April	May	June
Cement Bags	4000	6000	8000	10000	12000	16000
Months	July	Aug	Sept	Oct	Nov	Dec
Cement Bags	13000	11000	8000	6000	4000	2000

Consider under stocking cost 3% of total cost of cement bags causing understock and overstocking cost 4% of total cost of cement bags causing overstock. Determine the total cost by six monthly model for above given

- a) Decide the optimum no. of associated units for the prime mover based on the following data: [12]
- (i) Mean cycle time of the prime mover = 5 minutes
 (ii) Mean haul time of the associated unit = 10 minutes
 (iii) Haul Unit capacity – 5 cu.m.
 (iv) Hourly cost of prime mover, C_p = Rs. 6000/-
 (v) Hourly cost of associated unit, C_A = Rs. 2000/-

Based on conventional practice, for this work, 5 associated units were assigned. Using Griffi's waiting line model, decide whether the associated units assigned are optimum or adding unnecessary extra cost to the project. Justify your decision.