



Shri Vile Parle Kelavani Mandal's  
**DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING**

(Autonomous College Affiliated to the University of Mumbai)  
NAAC Accredited with "A" Grade (CGPA : 3.18)



**MAIN ANSWER - BOOK**

The Answer Book is bar coded. Identity of the students in any form should not be revealed in the answer book/s supplementary sheet

SUPERVISOR'S SIGNATURE WITH DATE

*SVKM 18/25*



AFFIX BARCODE HERE

PROGRAMME: Mechanical (REGULAR / Re-Examination)  TICK WHICHEVER IS APPLICABLE

EXAM DATE: 4/8/2025 SEMESTER: IV / 24 - 25

SUBJECT: NST PAPER: \_\_\_\_\_

MAIN ANSWER BOOK: 1+ SUPPLEMENTARY SHEET/S = \_\_\_\_\_ (TOTAL TO BE FILLED BY THE CANDIDATE)

**INSTRUCTIONS TO THE CANDIDATES**

- This answer-book contains 32 pages. Check whether the relevant answer-book provided contains 32 pages and whether the pages are properly numbered.
- Candidates should occupy their correct seats as per the seating plan displayed and write appropriate details in the space provided for the purpose.
- Candidates will not be permitted to leave the examination hall until half an hour after the question papers are distributed.
- Candidates, who are not in their seats by the time notified, will not as a rule, be permitted to appear for the examinations.
- Candidates must produce their photo identity card / hall ticket provided by the college for verification to the room/ block supervisor during the examination. Candidates without the valid identity card / hall ticket will not be allowed to appear for the examination.
- Every candidate present must sign against his /her student number on the attendance sheet provided by the room/ block supervisor.
- Candidates should ensure that all answer-books including supplementary sheets provided to them bear the signature of the room / block supervisor and date of examination without which the answer-book will not be examined. They should tie all supplementary sheets to the main answer-book relating to the same paper and enter on the first page of the answer-book, the total number of supplementary sheets tied together.
- Do not damage or make any stray marks on the barcodes.
- Write on both sides of a page. Rough work, when necessary should be done only in the answer-book by specifically marking the page as Rough Work.
- Candidates should write their answers in legible handwriting with blue / black pen only. Answers written in illegible handwriting or with pencil may not be evaluated.
- Candidates should not write their name, roll no., student no. etc., anywhere in the answer-book and reveal their identity in any form in the answers written by them. Writing these details or putting signature is revelation of identity. Use of religious invocation or any writing that is not relevant to the answers anywhere in the answerbooks will be treated as attempts to reveal identity.
- While underlining of answers for focusing attention is permitted. However, use of varied links, except for illustrations and figures must be avoided. DO NOT use any symbol like encircling the question or using colour arrows for P.T.O. These will all be considered as attempts to readily identify the specific answer-books and will be treated as unfair means.
- Candidates are forbidden to (i) bring any book, notes, scribbling paper, mobile phones or any other similar devices (ii) speak or communicate in any manner with any other candidate, while the examination is in progress (iii) take with them any answer-book, written or blank, while leaving the examination hall.
- Exchange of writing material, stencils, mathematical instruments, question-paper, etc., is strictly prohibited. If candidates want anything, they should approach the room / block supervisor without disturbing other candidates.
- All answer-books/supplementary sheets supplied should be returned back to the room / block Supervisor, whether written or blank. Smuggling /carrying the answer book/ supplementary sheet in/out of the examination hall will amount to adoption of unfair means.
- No sheet should be torn from the answer-books provided nor shall additional papers be attached to them.
- Any method to bribe the examiner/s by attaching currency notes or letters or making appeal inside the answerbook is strictly prohibited and will result in serious action being taken by the authorities.
- Candidates should not write anything on the question-paper.
- Candidates suspected to be guilty of any of the aforesaid acts will be allowed to write their paper only after giving an undertaking in writing that the decision of the Institution in respect of the reported act of unfair means, is binding on them.
- The answer-books will be scrutinised before they are sent to examiners. If the college authorities are convinced that any candidate has attempted to reveal his / her identity by any means, the answer-books may NOT be sent to the examiner for evaluation and the candidate's case will be dealt with as per the provisions of University Ordinance 5050.
- A warning bell will be given ten minutes before the close of the examination. Candidates will not be allowed to leave the examination hall during the last ten minutes. At the final bell, they must stop writing and hand over their answer-books to the room / block supervisor. They should not leave their seats until answer-books from all candidates are collected by the supervisor.
- A candidate who disobeys any instructions issued by the Senior / Room Supervisor or who is guilty of rude or disobedient behaviour is liable for disciplinary action to be taken against him/her by the institution.
- Candidates are requested to go through the provisions of the Maharashtra Act O. XXXI of 1982, i.e. an Act to provide for preventing malpractices at University Board and other specified examinations, published in the Maharashtra Government Gazette, dated 14th October, 1982. Every offence under this Act is a cognizable and non-bailable offence.

QUESTION NOS.	MARKS AWARDED	MODERATED MARKS	MARKS AFTER REVALUATION
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
Total			
	Examiner's Signature	Moderator's Signature	Re-Valuator's Signature

IT IS PRESUMED THAT CANDIDATE HAS READ ALL THE ABOVE INSTRUCTIONS.

Space for  
marks Question  
No.

| B | .

B. 1.

X	75	81	70	76	77	81	84	75
Y	62	68	65	60	69	72	76	72

$$\bar{x} = 77.37$$

$$\bar{y} = 68$$

X	Y	$x - \bar{x}$	$y - \bar{y}$	$(x - \bar{x})^2$	$(y - \bar{y})^2$
75	62	-2.37	-6	-5911.11	-4562
81	68	-3.63	0	-5905.11	-4556
70	65	7.37	-3	-5916.11	-4559
76	60	1.37	-8	-5910.11	-4564
77	69	0.37	1	-5909.11	-4565
81	72	-3.63	4	-5905.11	-4552
84	76	-6.63	8	-5902.11	-4548
75	72	2.37	4	-5911.11	-4552

$$\Rightarrow \sum x = 619$$

$$\Rightarrow \sum y = 544$$

$$\Rightarrow \sum (x - \bar{x})^2 =$$

$\Rightarrow$

Space for  
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No.

1. B 1

B. 1

x	75	81	70	76	77	81	84	75
y	62	68	65	60	69	72	76	72

$$\bar{x} = 77.37$$

$$\bar{y} = 68$$

x	y	$x - \bar{x}$	$y - \bar{y}$	$(x - \bar{x})^2$	$(y - \bar{y})^2$
75	62	-2.37	-6	5.61	36
81	68	-3.63	0	13.17	0
70	65	7.37	-3	54.31	9
76	60	1.37	-8	1.87	64
77	69	0.37	1	0.136	1
81	72	-3.63	4	13.17	16
84	76	-6.63	8	43.95	64
75	72	2.37	4	5.616	16

$$\sum x = 619$$

$$\sum (x - \bar{x}) = -4.78$$

$$\sum y = 544$$

$$\sum (y - \bar{y}) = 0$$

$$\sum (x - \bar{x})^2 = 137.83$$

$$\sum (y - \bar{y})^2 = 206.$$

$\Rightarrow$  Using Karl Pearson's

$$\frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2} \cdot \sqrt{\sum (y - \bar{y})^2}} = \frac{-4.78 \cdot 0}{\sqrt{137.83} \times \sqrt{206}} = 0$$

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No.

2.Ai

A

$$\text{i) } P = 5\% = \frac{5}{100} = 0.05$$

$$n = 100$$

$$m = n \cdot p = [100 \cdot 0.05] = 5$$

$$P(X = r) = \frac{e^{-m} \cdot m^r}{r!}$$

$\Rightarrow$  i  $\rightarrow$  Not more than 4 pin by Poisson dist.  
 $\Rightarrow [P(X < 4)]$

$$\Rightarrow P = P(X=0) + P(X=1) + P(X=2) + P(X=3)$$

$$\Rightarrow = \frac{e^{-5} \cdot 5^0}{0!} + \frac{e^{-5} \cdot 5^1}{1!} + \frac{e^{-5} \cdot 5^2}{2!} + \frac{e^{-5} \cdot 5^3}{3!}$$

$$\Rightarrow 0.00673 + 0.03368 + 0.08422 + 0.14037$$

$$\Rightarrow [0.265]$$

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2.B

B.

$$x(x, 0) = x(4-x), u(0, t) = u(4, t) = 0$$

where  $h=1$   $k=1$   $t=5$ .

$$u(0, t) = 0, u(4, t) = 0$$

The Interval for  $x = [0, 4]$

~~Since~~ Since  $h=1$

$$x_0 = 0, x_1 = 1, x_2 = 2, x_3 = 3, x_4 = 4$$

$$\text{when } \rightarrow \frac{\partial^2}{\partial x^2} = \frac{a^2}{h^2} = b^2 \text{ then } \rightarrow$$

$$\boxed{\frac{1^2}{1} = 1}$$

$$\Rightarrow t_0 = 0, t_1 = 1, t_2 = 2, t_3 = 3, t_4 = 4, t_5 = 5$$

$$u(x, 0) = x(4-x)$$

$$\text{when, } u(0, 0) = 0(4-0) = 0$$

$$u(1, 0) = 1(4-1) = 3$$

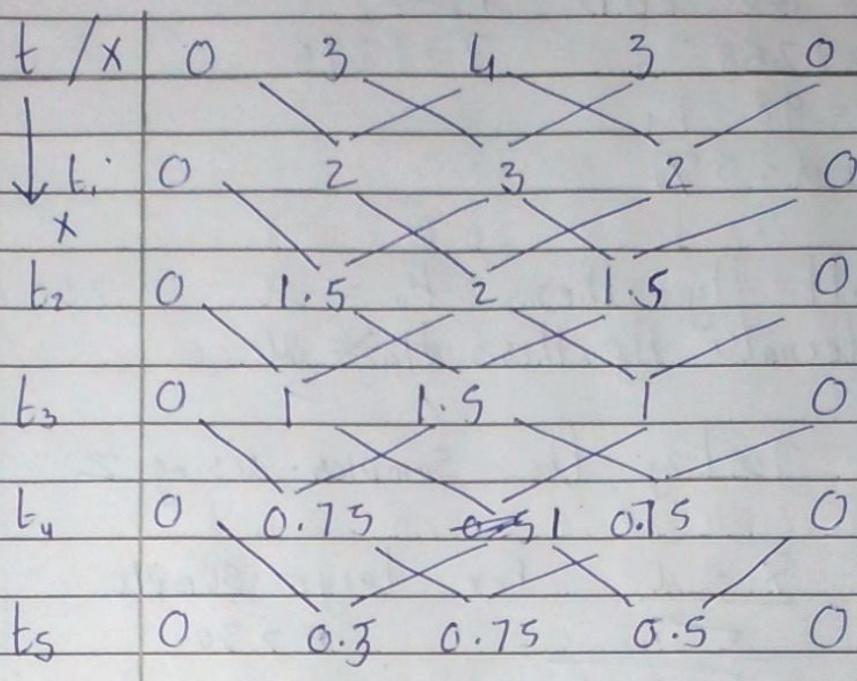
$$u(2, 0) = 2(4-2) = 4$$

$$u(3, 0) = 3(4-3) = 3$$

$$u(4, 0) = 4(4-4) = 0$$

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$\rightarrow t.$



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Question  
No.

3. A.

i

$$n_1 = 100 \text{ belts} \quad n_2 = \\ M = 1258 \quad \bar{x} = 1275 \\ S.D = 98 \text{ kg} \\ \text{Loss } \alpha = 5\%$$

$\Rightarrow$  Null Hypothesis  $H_0: \mu = M$   $n > 30$  - large sample.  
Alternative Hypothesis  $H_a: \mu \neq M$ .

$\Rightarrow$  By Testing the Samples using Z

$$= \frac{\bar{x} - \mu}{\sqrt{\frac{s^2}{n}}} \text{ For large sample} \\ n > 30.$$

$$= \frac{1275 - 1258}{\sqrt{\frac{98^2}{100 - 1}}} = \boxed{1.725}$$

$$\Rightarrow Z_{cal} = \boxed{1.725}$$

$$\Rightarrow |Z| = \boxed{1.725}$$

$$\Rightarrow \text{Wt. loss when Loss is } 5\% = \frac{5}{100} = 0.05$$

$$\Rightarrow |0.45| = |Z|_{\text{Table}}$$

Commit  $\Rightarrow$  The test sample is accepted

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Question  
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3.B.

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4. 11

$\Rightarrow$  Chi-square Distribution.

Seasons	Sales man				Total
	A	B	C	D	
Summer	36	36	21	36	
Winter	28	29	31	31	
Monsoon	26	28	29	29	300

$$M_0 = M = A$$

$$M_{\text{obs}} = M \neq A$$

$\Rightarrow$  Sum of number.  $T = 300$   $N = 12$

$$\Rightarrow \frac{T^2}{N} = 10800$$

$$\rightarrow \frac{360^2}{14} = 10800$$

$$\Rightarrow \sum n_i j^2 \\ = 36 \times 28$$

Space for  
marks

Question  
No.

4:

$\Rightarrow \text{Chi Square}$

No. Boys	0	1	2	3	4	Sum 10
No. girls	4	3	2	1	0	10
No. Families	32	178	290	236	64	800
	36	182	294	240	68	820

$$\Rightarrow \varepsilon_0 (0) = \frac{36 \times 10}{820} = 0.439 / 0.87$$

$$\varepsilon_1 (1) = \frac{182 \times 10}{820} = 2.219 / 4.43$$

$$\varepsilon_2 (2) = \frac{294 \times 10}{820} = 3.585 / 7.17$$

$$\varepsilon_3 (3) = \frac{240 \times 10}{820} = 2.926 / 5.853$$

$$\varepsilon_4 (4) = \frac{68 \times 10}{820} = 0.829 / 1.65$$

$$\sum \varepsilon_i = 17.070 + 19.973 = 37.043$$

$\Rightarrow O_i = \text{No. families}$

$$O_1 (32) = \frac{36 \times 800}{820} = 35.121$$

$$O_2 (178) = \frac{182 \times 800}{820} = 177.56$$

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$$o_i(290) = \frac{294 \times 800}{820} = 286.82$$

$$o_i(234) = \frac{230 \times 800}{820} = 234.14$$

$$o_i(68) = \frac{68 \times 800}{820} = 66.341$$

$$\Rightarrow \frac{\sum (o_i - \bar{o}_i)^2}{\sum o_i} = \frac{37.14 - 798.68}{}$$

$\Rightarrow$  The manufacturers make as electric bulbs  
 Mean of 25 and S.D of 5  
 And 6 Sample of bulbs and it gives  
 level of significance 1%

$$\bar{x} = 25 \quad L.O.S = 1\% = \frac{1}{100} = 0.01$$

$$S.D = 5$$

$$n = 6 \quad \boxed{\text{Table} = 0.0438}$$

where,

$x =$	24	26	30	20	20	18	Sum. = 138.
$x - \bar{x} = d$	-1	1	5	-5	-5	-7	-12
$(x - \bar{x})^2 = d^2$	1	1	25	25	25	49	126

$$\sum x = 138$$

$$\sum (x - \bar{x})d = -12$$

$$\sum (x - \bar{x})^2 d^2 = 126$$

$$\Rightarrow \bar{x} = a + \frac{d}{n}$$

$$\rightarrow \frac{25 + (-12)}{6} = 2.166$$

$$\Rightarrow \sum (x - \bar{x}) = \sum d^2 - \frac{(\sum d)^2}{n}$$

$$\rightarrow 126 - \frac{(-12)^2}{6} = 102$$

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$$\Rightarrow S = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

$$\rightarrow \sqrt{\frac{(-12)^2}{6}} = 12.89$$

$$\Rightarrow \text{Testing the hypothesis by t-test.}$$

$$\Rightarrow \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n-1}}} = t$$

$$\rightarrow \frac{25 - 0}{\frac{2.89^2}{\sqrt{6-1}}} = 6.69$$

$$t = 6.69 \quad |t|_{\text{cal}} = 6.69$$

$$|t|_{\text{Table}} = 6.314$$

Null Hypothesis  $H_0 =$   
 Alternative Hypothesis  $H_a =$

$$|t|_{\text{cal}} > |t|_{\text{Table}}$$

$\Rightarrow$  Testing is Accepted

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