Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

April/May 2015

Duration: **3 Hours**

Total Marks: **100**

CLASS/SEM: **S.E (CIVIL)/IV**

SUBJECT: **APPLIED MATHEMATICS IV**
(& Probability & Statistics)

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.

Master

Q.1 (a) Find the analytic function whose real part is $u = \left(\dfrac{\sin 2x}{\cosh 2y - \cos 2x} \right)$ — **6**

(b) A drug is given to 10 patients and increments in their blood pressure were recorded to be 3, 6, -2, 4, -3, 4, 0, 0, 2, 6. Is it reasonable to believe that the drug has no effect on change of blood pressure? — **6**

(c) A company produces two types of goods P & Q, that required gold and silver. Each unit of type P requires 2 gms of silver and 1 gm. of gold while for type Q 1 gm. of silver and 2 gms of gold are required. The company has only 90 gms of silver and 80 gms of gold. Each unit of type P, gives a profit of Rs. 100 and each unit of type Q gives a profit of Rs. 500. Formulate this as an LPP & hence solve it graphically — **8**

Q.2 (a) The probability of a man hitting the target is ¼. (i) If he fires 7 times what is the probability of his hitting the target atleast twice? (ii) How many times must he fire so that the probability of his hitting the targets atleast once is greater than 2/3? — **6**

(b) Find the bilinear transformation which maps the point $z = 1, i, -1$ onto $w = i, 0, -i$ — **6**

(c) Show that the transformation $w = \dfrac{3-z}{z-2}$ transforms the circle with center $\left(\dfrac{5}{2}, 0\right)$ and radius $\dfrac{1}{2}$ in the z – plane into the imaginary axis in the w – plane and the interior of the circle into the right half of the plane. — **8**

Q.3 (a) Evaluate $\oint_c \dfrac{\cos \pi z}{z^2 - 1} dz$ where c is the rectangular whose vertices are $2 \pm i, -2 \pm i$ — **6**

(b) The number of arrivals of customers during any day follows Poisson distribution with a mean of 5 What is the Probability that the total number of customers on two days Selected at random is — **6**
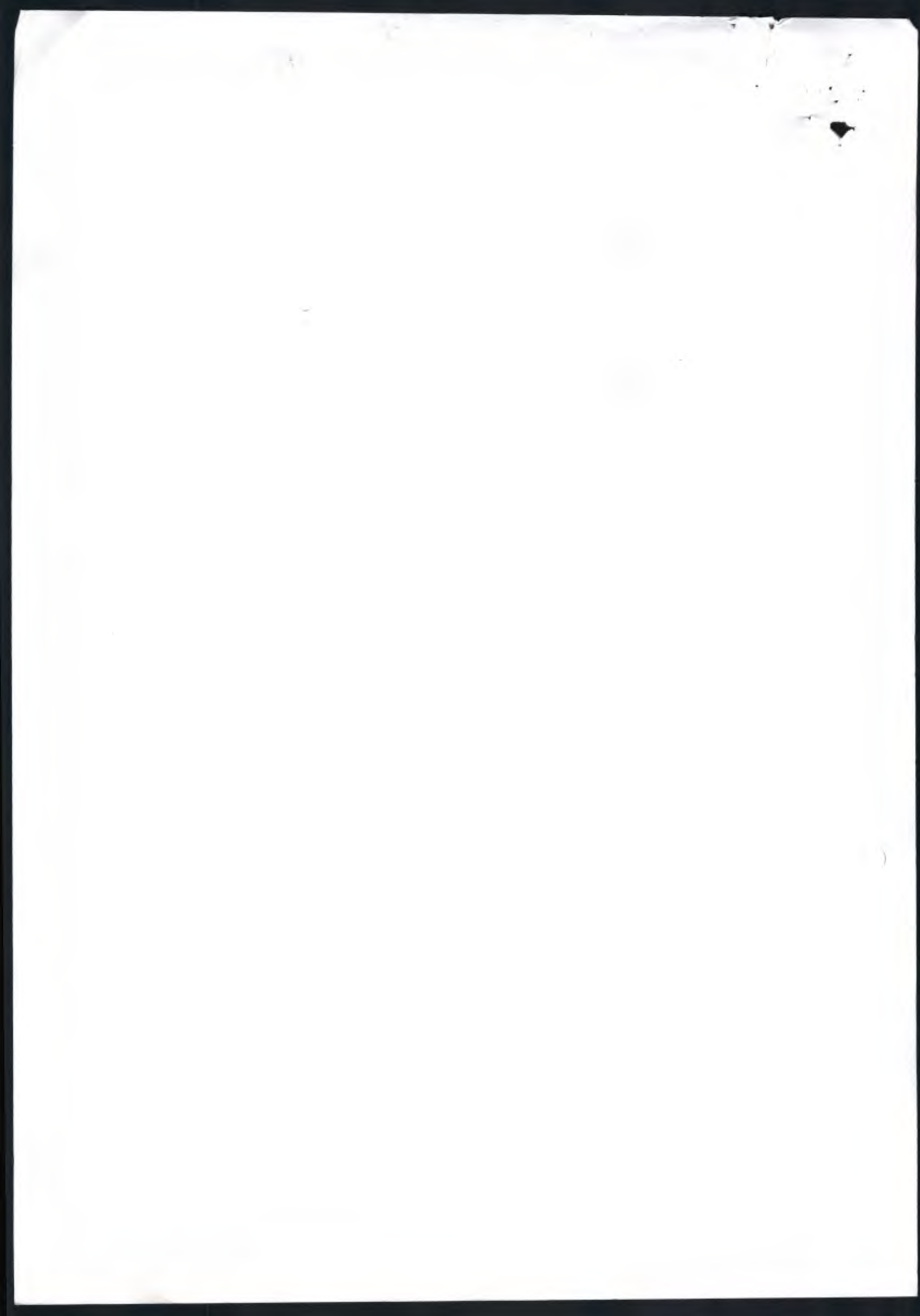
probability of securing total marks (i) 180 or more (ii) 90 or below

6(a) The heights of six randomly chosen sailors are in inches;63,65,68,69,71 & 72.The heights of ten randomly chosen soldiers are;61,62,65,66,69,69,70,71,72&73.Discuss in the light of this data that the soldiers on an average are as tall as the sailors. **6**

(b) Evaluate using residue theorem $\int_0^\infty \dfrac{dx}{x^4+1}$ **6**

(c) If X & Y are random variables with the same standard deviation σ and zero correlation then show that $U = X\cos\alpha + Y\sin\alpha$ & $V = X\sin\alpha - Y\cos\alpha$ have zero covariace. **8**

7(a) Seven coins are tossed and number of heads obtained is noted.The experiment is repeated 128 times and following distribution is obtained.
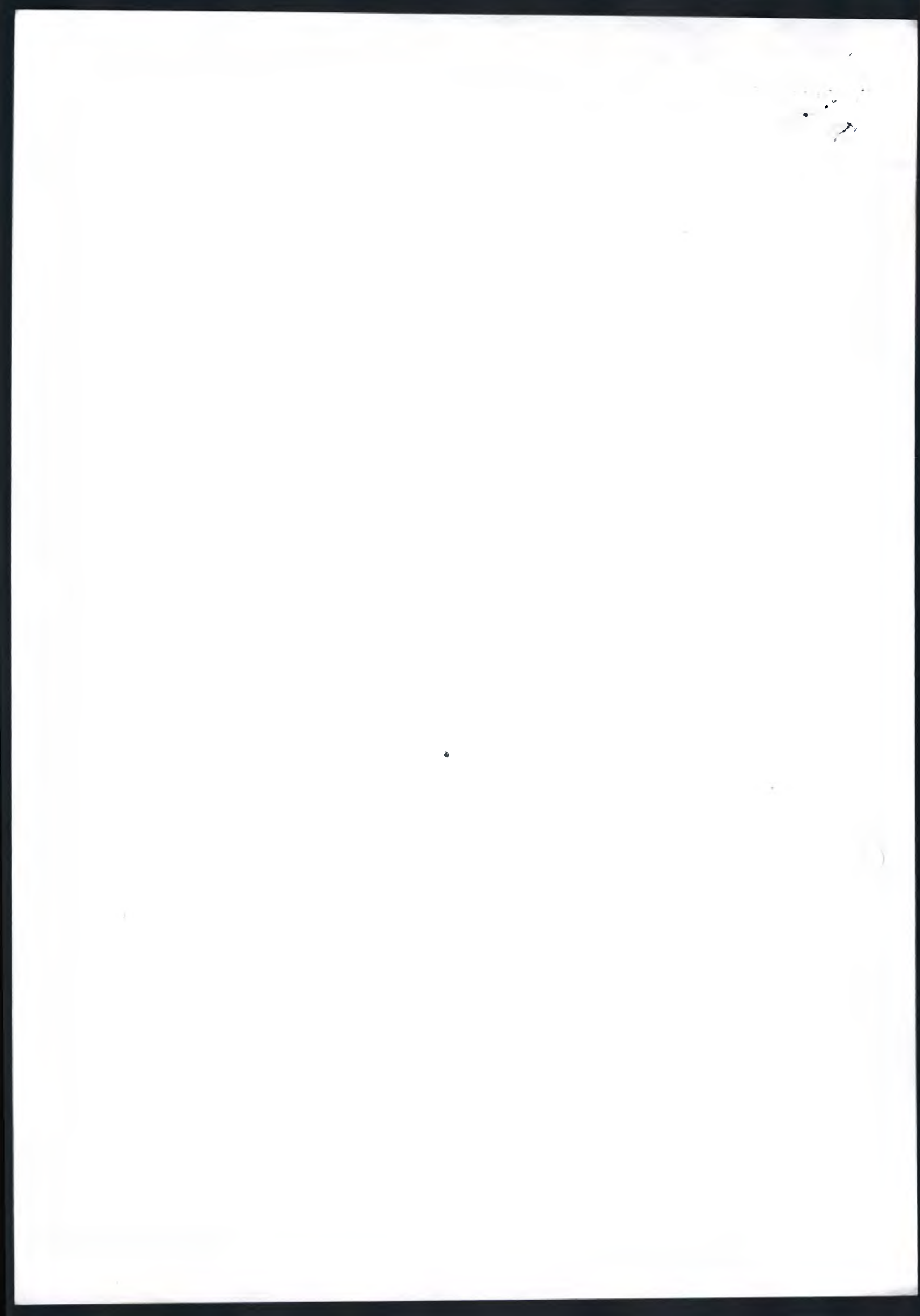
No.of heads	0	1	2	3	4	5	6	7	Total
Frequency	7	6	19	35	30	23	7	1	128

Fit a Binomial distribution if the nature of coins is unknown. **6**

(b) Find the image of the area between $x^2+y^2 = 4$ and $x^2+y^2 = 9$ in the z – plane into the w – plane under the transformation $w = \log z$ **6**
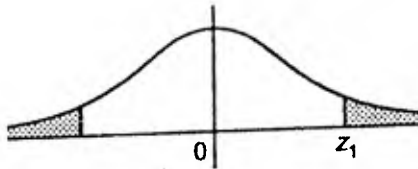
(c) From adult male population of four metros, random samples of sizes given below were taken and the no. of married and single men recorded. Does the data indicate significant variations among the cities in the tendency of men to marry? **8**

City	Delhi	Mumbai	Chennai	Kolkatta	Total
Married	137	164	152	147	600
Single	32	57	56	35	180
Total	169	221	208	182	780

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Applied Mathematics - IV
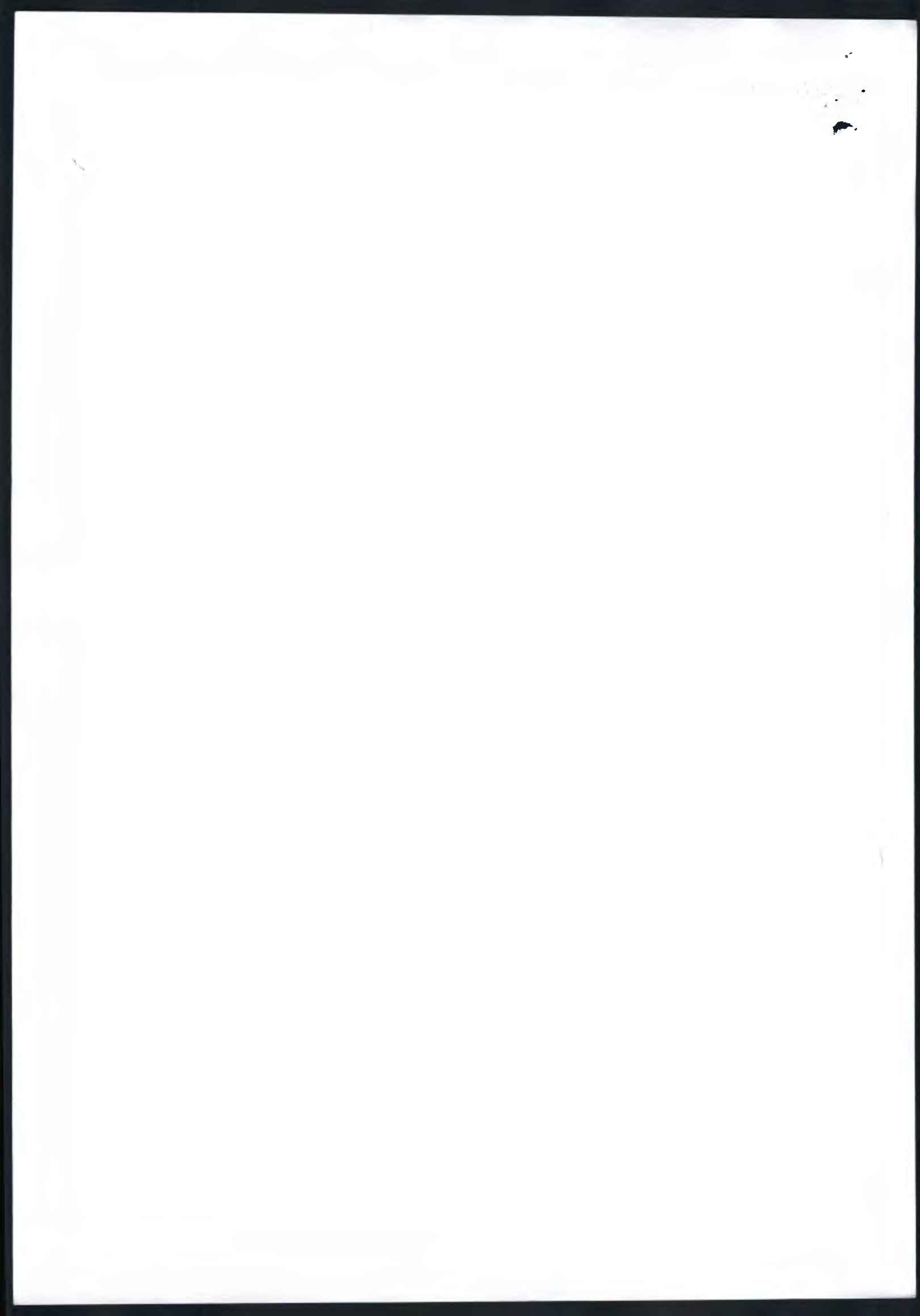(Civil / Const. / Prod.)

(II)

Statistical Tables

Percentage Points of t - distribution

Example

For $\Phi = 10$ d. o. f.

$P(|t| > 1.812) = 0.1$

Φ \\ P	0.20	0.10	0.05	0.02	0.01
1	3.078	6.314	12.706	31.812	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.287
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.325	2.576

SARDAR PATEL COLLEGE OF ENGINEERING

Andheri (west), Mumbai -58

END SEMESTER EXAM – April 2015

Total Marks: 50

Subject: **Presentation & Communication Techniques**

Class: IV Semester Electrical, Mechanical, Civil / (SE) (C/M/E)

Duration: 2 hrs

Date: _Master_

Instruction: All Questions are compulsory.

Q.1. Fill in the blanks. (2marks)

    i) _____ represents the unofficial channels of communication which are created and controlled by people themselves rather than the management.

    ii) _____ communication is used to explain to the subordinates the rationale of their jobs so that they understand the significance of their work in relation to organizational goals.

    iii) _____ is a formal gathering of persons for the purpose of discussing and deciding matters of common interests of all of them.

    iv) The official records of the proceedings of a meeting is known as the _____.

Q.2. Prepare a minute of narration based on the following notice and agenda for a meeting. (8 marks)

NOTICE

25 April 2015

It is hereby informed that the fifth meeting of Board of Directors of the ABC Company will take place in the Board Room, Corporate Mansion, on 28 April 2015, at 10.00 am.

Following are the agendas for meeting:
1. Confirmation of minute of previous meeting
2. Consideration of Report of the expert Committee for proposed setting up of a new plant
3. Consideration of issue of new employee health benefits
4. Consideration of the proposal for new employee training program
5. Any other matter with the permission of the Chairman
5. Date of next meeting

S.K. Arora
Secretary

Q.3. You are an employee of sales department of Tesco International Pvt. Ltd. From past few months employees in the department have been suffering from physical and mental health issues. An effect of which is visible in the productivity and efficiency of the department. Your boss, the Sales Manager has asked you to look into the matter, and submit an analytical report based on your investigation and observation, with recommendations for physical as well as mental health issues. Write in memo report format. (10 marks)

Q.3. Discuss any one behavioral theory of leadership in detail. (5marks)

Q.4. Discuss any five disadvantages of group decision making in brief. (5 marks)

Q.5. List any 10 tips for making effective Powerpoint Presentation. (5 marks)

Q.6. What is 80:20 rule of time management and how to you develop 80:20 thinking. (7 marks)

Q.7. State whether following is true or false. Give reasons to your answer. (8 marks)

    i) Your communication will be very effective if you use impressive vocabulary and correct grammar.

    ii) The message sent is not always the same as the message received.

    iii) A successful leadership does not depend on appropriate behavior, skills, actions and personal traits. Because leaders are born and not made.

    iv) In a group, more the number, more knowledge and information can flow in.

* *

BHARTIYA VIDYA BHAVAN'S
SARDAR PATEL COLLEGE OF ENGINEERING

[An Autonomous Institution Affiliated to University of Mumbai]

SUBJECT: Presentation and Communication Techniques (2014-2015)

SEC(CIVIL)

Total Marks: 50   **CLASS/SEM: IV**   **Duration: 2 Hour**

Master

1) All Questions are compulsory.
2) Figures to the right indicate marks.

Q.1. A company is considering a proposal to establish a new factory in your town. The managing Director has asked you to write a report on the suitability of the place for the establishment of this factory. For this report, an outline is provided below. Study it carefully and rewrite it in accordance with the principles of coordination, subordination, phrasing, numbering, ordering, etc. Write the Complete report in letter form.   **-10-**

Establishment of a New Factory

Outline

1. Introduction
2. Fire fighting and Communication facilities
    i. Telephone
    ii. Fax
    iii. Films
    iv. Games
3. Education and Entertainment facilities
4. How is the market
    a. Potential
    b. General
5. Labor from Local and other Plants
    5.1 Raw Materials
    5.2 Cost
6. Transport Facilities
    6.1 Rail, Road, Air
    6.2 Raw Materials
        a. Building
        b. Infrastructural
7. Recommendations
8. Conclusions

Q.2.A. What factors will you bear in mind while giving an oral presentation before a large group? Write 15 most important steps.   **-05-**

Q.2.B. Define Leadership and explain the functions of a leader.   **-05-**

Q.3.A. List ten top Time-wasters. List five effective time management tips.   **-05-**

Q.3. B. What is Group dynamics? Explain 5 characteristics of an effective group .   **-05-**

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Q.4.A. As an effective Manager what strategies will you adopt to conduct an effective meeting.
-05-

Q.4. B. Read the case below and answer the questions:- -10-

Dr. Ahmed Khan was the public management department chair person for ten years at Hindu University. His leadership style was explained as "autocratic". However, he had, "personal qualities necessary to command respect and loyalty". Additionally, Dr. Ahmed Khan made and enforced all rules, regulations and policies in extreme detail. His autocratic style of leadership left very little to the individual faculty member in terms of experimentation, freedom in teaching and handling of students. His style of leadership caused the faculty to be "passive, subservient, dependent and ambivalent". However, faculty morale was generally high and faculty turnover was modest. Many faculty members trusted Dr. Ahmed Khan and felt that they were not restricted.

When Dr. Ahmed Khan suddenly died he was replaced by Dr. R. R. Rangaswamy case study holds that Dr. Rangaswamy came from a neighbouring university where he held a position as a faculty member and assistant department chairperson. Dr. Rangaswamy's leadership style was in sharp contrast to Dr. Ahmed Khan. Dr. Rangaswamy believed strongly in the concept of "democratic administration". In other words, he believed in delegating tasks to his subordinates. For example, at the first department meeting of the semester, he articulated that he wanted to share the budgeting, scheduling and the allocation of supplies responsibilities with the members of the faculty. He believed that this would allow the faculty to have a greater role in the decision making process. Unfortunately, this led to decreased morale and a feeling that Dr. Rangaswamy was assigning chair person work to faculty members.

Furthermore, Dr. Rangaswamy did not assign the faculty any non-instructional duties, assuming that the faculty would participate in committee and department meetings, advice student groups with no interference from him. However, this did not happen and was eventually noticed by the dean, and Dr. Rangaswamy was invited for a "chat". During this "chat" the dean and the provost stated that they "no longer know what's going on in the 'public Management Department' and were concerned that perhaps Dr. Rangaswamy was not up to the job of department chair".

   a. Explain the leadership traits of both Dr. Ahmed Khan and Dr. Rangaswamy? -04-
   b. How a change in leadership has caused a successful Public Management Department to be deemed unsatisfactory by the Dean? And why? -04-
   c. Write recommendations as Dean to improve the situation. -02-

Q.5. Fill in the blanks:- -05-
   a. The informal channel of communication is also called_____.
   b. _____is the Redressal forum in an organization.
   c. _____for a meeting should be circulated in advance.
   d. A presentation with _____distracts the audience than captures the attention of an audience.
   e. The capacity for recognizing our own feelings and those of others for motivating and for managing emotions is called as _____.
   f. _____types of reports analyze problems and present a conclusion and also give recommendations.

All the Best

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Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering
MUNSHI NAGAR, ANDHERI (WEST), MUMBAI-400 058.

May: 2015

S. E. (Civil), Semester – IV, (End sem. Examination)
Subject: Surveying - II

Marks: 100, Duration- 3 Hour

1.Question Number 1 is compulsory
2.Attempt any four questions out of remaining six questions.
3. All questions carry equal marks.
4. Assume any data if required and state them clearly.

Master

Que. 1a) Describe in detail the method of setting out a simple curve by Rankine's Deflection angle method.   **06**

b) Write a note on Geographic information System (GIS).   **04**

c) Determine the length of vertical curve to satisfy the minimum sight distance of 200 m to join an upgrade of + 1.8 % with a downgrade of -1.2 %. Assume the height of the drivers eye is 1.4 m and the height of obstruction is 0.10 m.   **06**

d) Explain basic principles of triangulation.   **04**

Que.2 a) What is transition curve? When and why it is used?   **05**

b) Explain briefly the degree of curve.   **05**

c) In a Tacheometric Survey made with an instrument whose constants are 100 & 0.5, the staff was inclined so as to be normal to the line of sight for each reading. calculate the gradient of line AB and Elevation of A & B. if that of 'P' is 51.8m.   **10**

Instrument Station	Staff Station	H.I.	Bearing	Vertical angle	Stadia Reading
P	A	1.3	65^0	$+4^0\,30$	1.00 ,1.417,1.833
	B	1.3	135^0	$-4^0\,00$	1.00, 1.657,2.313

Que.3 a) Two uniform grades 0.4% and -0.5% are to be connected by a vertical curve having the chain age and elevation of the point of intersection of its two tangents as 2500 m and 280 m, respectively. Calculate the reduced levels of the various stations on the curve assuming rate of change of grade to be 0.05% per 20 m chain.   **10**

b) What do you understand by setting out work? How would you conduct setting out work for a bridge project.   **10**

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Que.4 a) Discuss in detail method of precise levelling?   **08**

b) A highway curve having a deflection angle of 78^0 is to be desire for a maximum   **12**

speed of 120 km/hr, a maximum centrifugal ratio of 0.25 and a minimum rate of change

of radial acceleration of 0.3 m/sec^2/sec. The combined curve consist of two cubic spirals

and a circular curve. Calculate (i) The radius of the circular curve

(ii) The length of the cubic spiral

(iii) The total length of the combined curve

(iv) The chainages of all salient points if the chain age of the point of intersection is 3100 m.

Que. 5 a Discuss the steps involved to carry out tunnel survey.   **10**

b) Enumerate the data required for setting out simple curve by method of chord   **10**

produced with the following data:

(i) Radius of curve = 300 m

(ii) Chainage of PI = 2450 m

(iii) Angle of intersection = 120^0

(iv) Assume peg interval of 30 m.

Que.6 a) A compound curve is to connect two straights having deflection angle of 78^0.   **10**
The radii of smaller and larger arcs are to be 220 m & 540 m, respectively. Calculate
The length of larger tangents, if the length of smaller tangents is to be 330 m. Also
calculate the chainage of point of tangency if that of point of intersection is 1750 m.

b) Derive an expression for determination of horizontal distance and elevation of point

in tacheometry for inclined line of sight with the staff held vertical.   **10**

                                                                                                                                       20

Que. 7 Write short notes on the following.

i) Permanent adjustment for precise levels.

ii) Selection of Triangulation station

iii) Electronic Distance measurements.

iv) Electronic Tacheometer

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Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering
MUNSHI NAGAR, ANDHERI (WEST), MUMBAI-400 058.

May: 2015

S. E. (Civil), Semester – IV, (End sem. Examination)
Subject: Surveying - II

Marks: 100, Duration- 3 Hour

1.Question Number 1 is compulsory
2.Attempt any four questions out of remaining six questions.
3. All questions carry equal marks.
4. Assume any data if required and state them clearly.

Master

Que.1 a) Why a parabola is used as a vertical curve? Why not a circle? **05**

b) Write a note on Global Position System (GPS). **05**

c) Determine the horizontal distance between the Theodolite and Subtense bar if the horizontal angle subtended by a Subtense bar with targets at 3.0 m apart is 0^0 34' 00". **05**

d) Explain transfer of alignment inside the tunnels. **05**

Que.2 a) Explain in detail the procedure for setting out combined curve by deflection angle method. **10**

b) A gradient of – 1.0 % meets a gradient of +2.0 % at a chainage of 2000 m and elevation of 330 m. A vertical curve of length 150 m is to be set out with pegs at 15m interval. Calculate the elevation of pegs by chord gradient method. **10**

Que.3 a) What is intrinsic equation of the ideal transition curve ? Derive the expression for the same. **06**

b) Discuss in brief importance of sight distance in case of vertical curves. **04**

c) A road bend which deflects 75° is to be designed for a maximum speed of 80 Km/ hr with a circular arc combined with two cubic spirals. If the radius of circular curve is 230 m and the max. rate of change of radial acceleration is 0.3 m/sec^2/sec. Calculate i) Length of transition curve ii) The chainages of the salient points, if chainage of point of intersection is 1500m. **10**

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Que.4 a) The following data refers to a traverse run by a tacheometer fitted with analytic lens. The constant of the instrument was 100 & the staff was **Normal.**　　　　**10**

Line	Bearing	Vertical angle	Stadia readings.
AB	30^0 24'	$+5^0$ 6'	2.375,2.125,1.875
BC	300^0 48'	$+3^0$ 48'	2.095,1.770,1.445
CD	226^0 12'	-2^0 36'	2.545,2.135,1.725

Find the Length and Bearing of DA.

b) What do you understand by setting out work? Explain in detail the procedure for setting out work of a sewer line.　　**10**

Que.5 a) A compound curve is to connect two straights having deflection angle of 82^0.　　**10**
The lengths of two tangents are 220 m & 260 m respectively. Calculate the length of two arcs, if the radius of the first curve is to be 245 m . Also calculate the chainages of point of Tangency if that of point of intersection is 1500 m.

b) What is precise levelling? Explain how it is conducted in the field?　　**10**

Que.6 a) Discuss the principle of triangulation surveys.　　**05**

b) Describe sources of errors in tacheometry.　　**05**

c) Tabulate the data necessary for setting out a circular curve by two theodolite　　**10**
method with following data:
(i)　　Angle of intersection = 135^0
(ii)　　Chainage of point of intersection = 1480 m
(iii)　　Radius of curve = 375 m. Assume length of full chord as 20 m.

Que.7　　Write short notes on the following (any four)　　**20**

(i)　　Auto level
(ii)　　Digital Theoodolite
(iii)　　Total station
(iv)　　Geographic Information System (GIS)
(v)　　Permanent adjustment for precise levels.
(vi)　　Classification of Triangulation system

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

June 2015
Duration : 3 Hours

Total Marks : 100
CLASS/SEM : SE (CIVIL) SEM IV
SUBJECT : STRUCTURAL ANALYSIS - I

- Attempt any FIVE questions out of SEVEN questions.
- If there are sub questions, **answers to all sub questions should be grouped together**.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly.
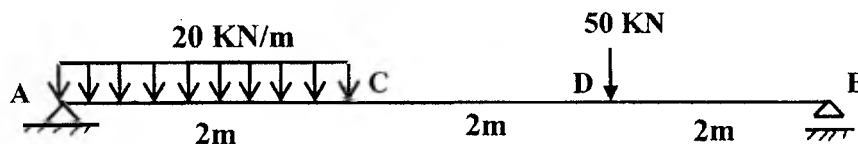
Master

Q.1 (a) For the frame loaded as shown in figure below   (15)
a) Find the support reactions
b) Draw AFD, SFD & BMD
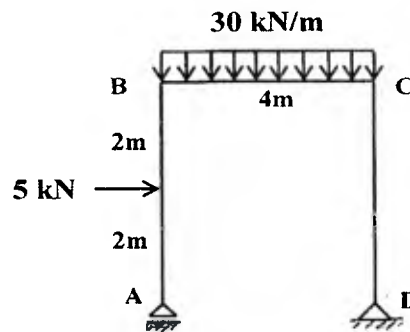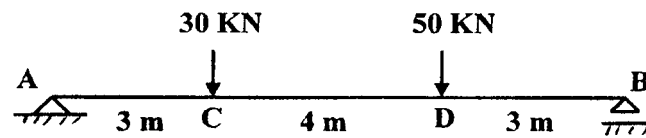

Q.1 (b) State and explain Maxwell's reciprocal theorem.   (05)

Q.2 (a) Find the slope at A and vertical deflection at D for the simply supported beam   (10)
shown in figure below. Use moment area method only.

Q.2 (b) Find the slope at A and vertical deflection at C for the simply supported beam   (10)
shown in figure below. Use conjugate beam method only.

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30 KN **50 KN**

A $\quad$ B

3 m $\quad$ C $\quad$ 4 m $\quad$ D $\quad$ 3 m

Q.3 (a) Determine the horizontal deflection at D of the rigid jointed frame loaded as (10) shown in figure below.
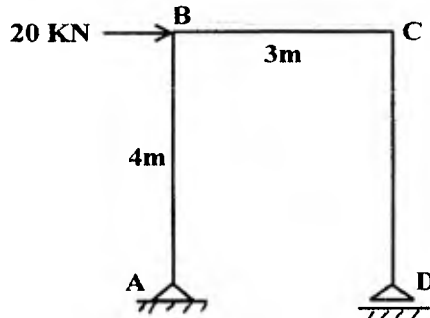
20 KN → B $\quad$ C

3m

4m

A $\qquad$ D

Q.3 (b) For the pin jointed frame loaded as shown in figure below, find the vertical (10) deflection of joint C.

B $\quad$ 4m $\quad$ D

4m $\quad$ 4m $\quad$ 4m $\quad$ 4m

A $\qquad$ E

4m $\quad$ C $\quad$ 4m

20 KN
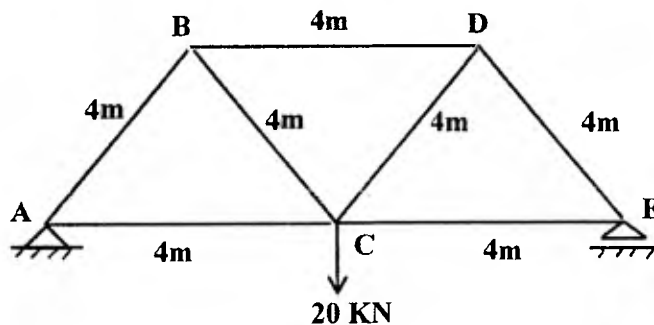
Q.4 (a) A symmetrical three hinged parabolic arch of span 30 m and central rise of 5 m (15) is subjected to a udl of 10 kN/m on the right half horizontal span of the arch and a concentrated loads of 60 kN at 7 m from the left support.
Determine
(a) the support reactions
(b) radial shear, normal thrust and BM just to the right of 60 kN load
(c) draw BMD

Q.4 (b) What are the advantages & disadvantages of an arch as compared to a beam of (05) the same span?

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Q.5   A suspension cable of span 120 m and a central dip of 10 m is connected to a   (20)
      three hinged stiffening girder. The dead load of the girder is 5 kN/m. Two point
      loads of 120 KN and 160 KN act at a distance of 30 m and 100 m respectively
      from the left support.
      (a) Determine the maximum and minimum tension in the cable.
      (b) Draw SFD and BMD for the girder.
      If the suspension cable passes over a smooth pulley on the top of a pier of height
      20 m and the anchor cable is at 50° to the horizontal, find the forces transmitted
      to the base of the pier.

Q.6 (a)   For a simply supported beam of span 12 m, draw influence line diagram for   (10)
          a) reaction at left support A
          b) shear force at a section D, 5m from left support A
   c) bending moment at a section E, 5m from left support A

Q.6 (b)   The load system shown in figure below crosses a simply supported girder of   (10)
          ‾span 10 m. Determine the value of maximum bending moment at a section 4m
          from the left support.
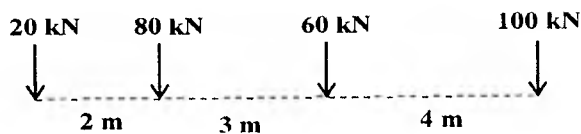
Q.7 (a)   Compare the crippling loads given by Euler's and Rankine's formulae for a steel   (10)
          hollow circular column 4.0 m long and fixed at both ends. The cross section of
          the column is having an external diameter of 160 mm and an internal diameter of
          50 mm. Take $E = 2 \times 10^5$ N/mm^2 , $f_c = 350$ Mpa and Rankine's constant as
          1/7000.

Q.7 (b)   For the pin jointed frame shown in figure below draw influence diagram for   (10)
          axial force in members DE, DF and EG.

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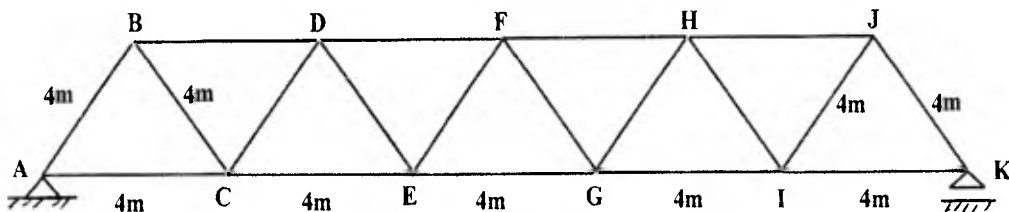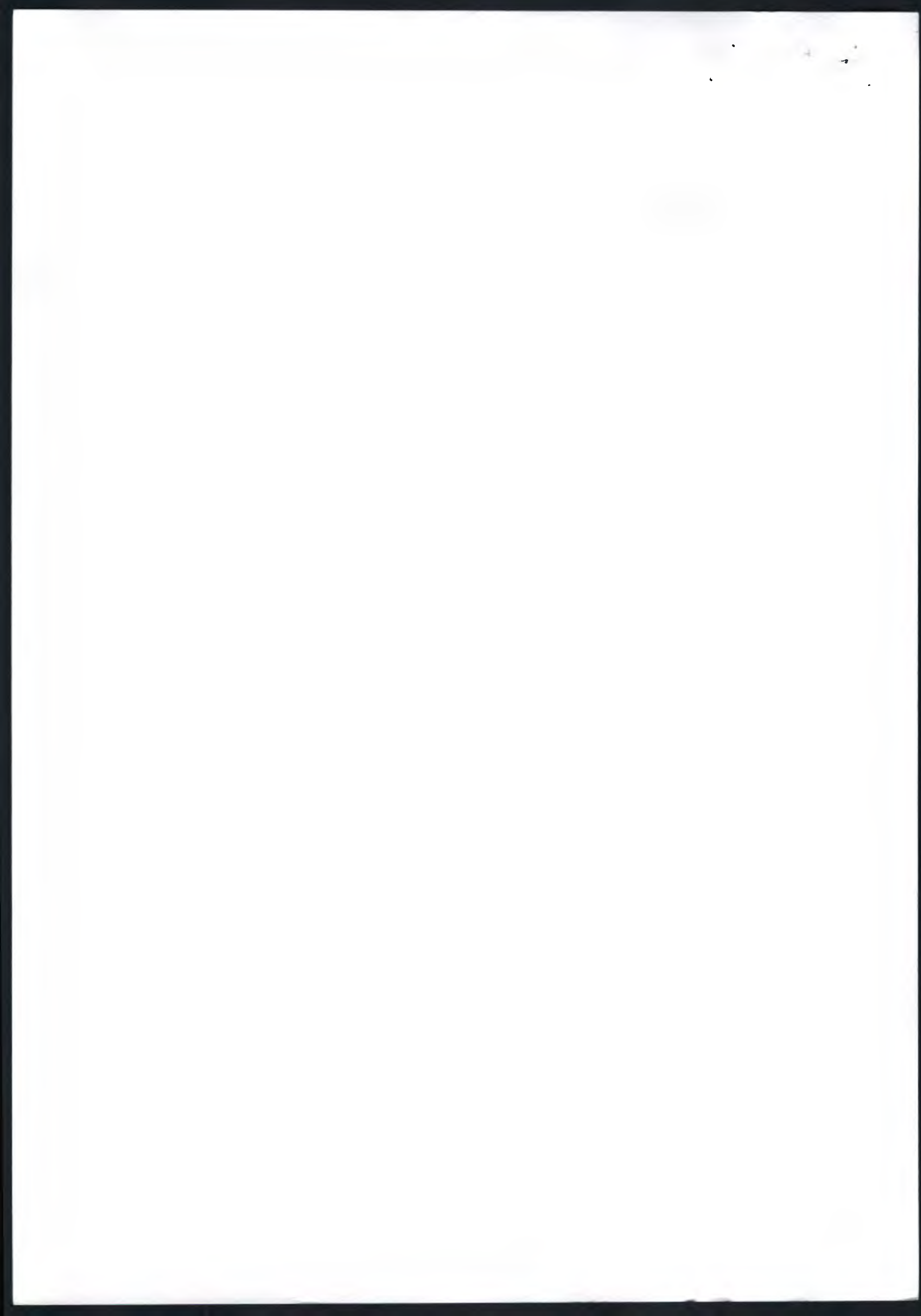
Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to University of Mumbai)

May 2015
Duration : 3 Hours

Total Marks : 100
CLASS/SEM : SE (CIVIL) SEM IV
SUBJECT : STRUCTURAL ANALYSIS - I

- Attempt any FIVE questions out of SEVEN questions.
- If there are sub questions, **answers to all sub questions should be** grouped together.
- Figures to the right indicate full marks.
- Assume suitable data if necessary and state the same clearly.

MASTER FILE.

Q.1 (a) For the frame loaded as shown in figure below (15)
a) Find the support reactions
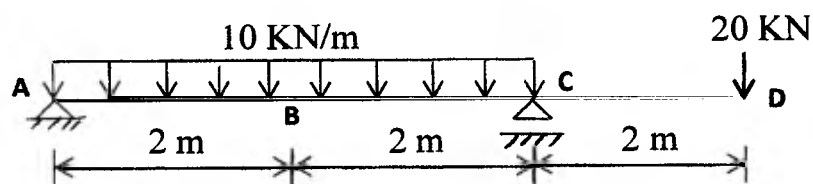b) Draw AFD, SFD & BMD
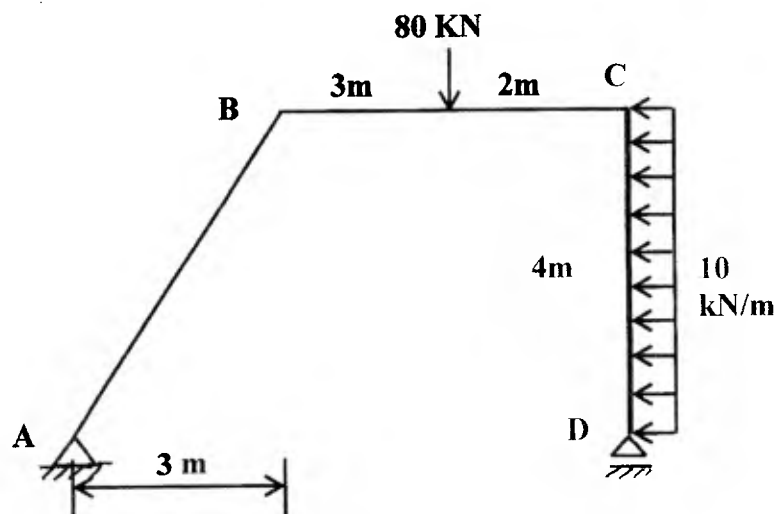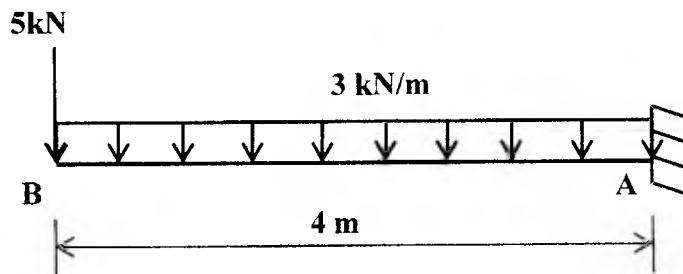

Q.1 (b) State and explain Betti's theorem. (05)

Q.2 (a) Find the slope at A and vertical deflection at D for the beam supported and (10) loaded as shown in figure below. Use moment area method only.
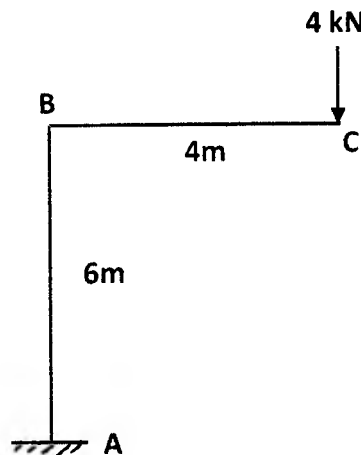
1

Q.2 (b)   Find the slope and vertical deflection at B for the beam supported and loaded as   (10)
shown in figure below. Use conjugate beam method only.

5kN

3 kN/m

B   **A**

4 m

Q.3 (a)   Determine the vertical and horizontal deflection of point C of the rigid jointed   (10)
frame loaded as shown in figure below.

4 kN

B

4m   **C**

6m

A

Q.3 (b)   For the pin jointed frame loaded as shown in figure below, find the vertical   (10)
deflection of joint D.

C   **E**

B

4 m   **4 m**

A   **F**

3 m   **D**   **3 m**

10 kN

2
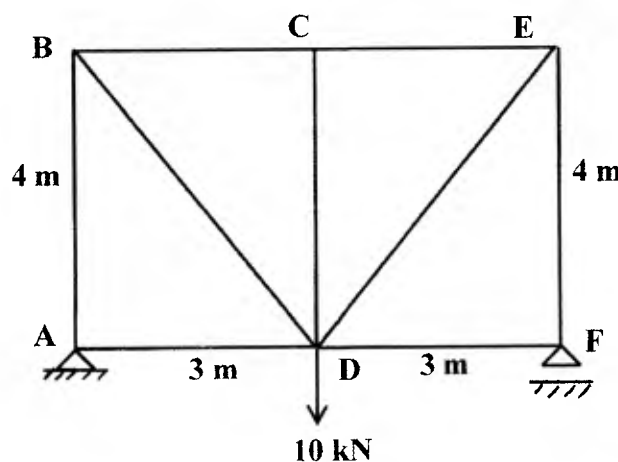
Q.4 (a) A symmetrical three hinged segmental arch of span 24 m and central rise of 4 m   (15)
is subjected to a udl of 6 kN/m on the left half horizontal span of the arch and a
concentrated loads of 80 kN at 6 m from the right support.
Determine
(a) the support reactions
(b) radial shear, normal thrust and BM just to the right of 80 kN load
(c) draw BMD

Q.4 (b) Name different components of suspension cable with three hinged stiffening   (05)
girder and state the internal forces carried by each one of them.

Q.5   A suspension cable of span 100 m is supported at A and B. The support A is 3m   (20)
above the lowest point C of the cable and B is 8 m above C. The cable is
connected to a three hinged stiffening girder. The third hinge of the girder is just
below the lowest point C of the cable. The dead load of the girder is 8 kN/m.
The girder is subjected to a point load of 50 kN at a distance of 10 m from
support A and another point load of 80 kN at a distance of 20 m from support B.
(a) Determine the maximum and minimum tension in the cable.
(b) Draw SFD and BMD for the girder.
If the suspension cable passes over a smooth pulley on the top of a pier of height
18m and the anchor cable is at 40^0 to the horizontal, find the forces transmitted
to the base of the pier.

Q.6 (a) For a cantilever beam of span 8 m, draw influence diagrams for   (10)
a) reactive moment at support A
b) shear force at a section C, 3 m from support A
c) bending moment at a section C, 3 m from support A

Q.6 (b) The load system shown in figure below crosses a simply supported girder of   (10)
span 16 m. Determine the value of absolute maximum bending moment
anywhere in the girder.

27 kN	27 kN	114 kN	114 kN
↓	↓	↓	↓

    1.1 m   3.2 m   1.2 m
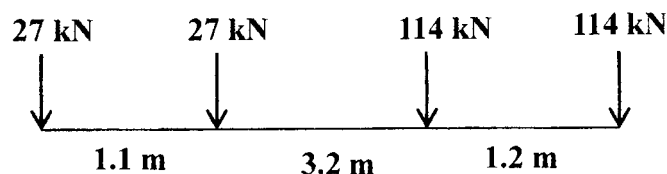
Q.7 (a) Compare the crippling loads given by Euler's and Rankine's formulae for a steel   (10)
column 5.0 m long and fixed at both the ends. The cross section of the column is
a symmetrical I section with the following dimensions.
Top and bottom Flange width = 300 mm,
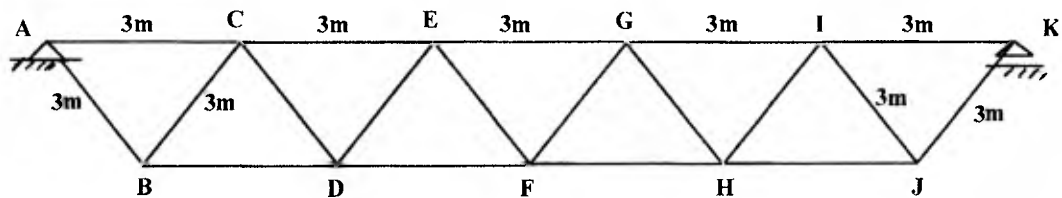Top and bottom Flange thickness = 25 mm,
Depth of web = 200 mm, Thickness of web = 20 mm.
Take $E = 2 \times 10^5$ N/mm^2, $f_c = 350$ Mpa and Rankine's constant as 1/7000.

Q.7 (b) For the pin jointed frame shown in figure below draw influence diagram for   (10)
axial force in members DE, DF and EG.
Note that the load moves on the top cord members.

page no. 4.

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SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

Concrete Technology
(100 MARKS)

Duration : 3 Hours

May 2015
SE (CIVIL) SEM IV

- **Question No. 1 is compulsory.**
- Attempt any four questions out of remaining six questions

MASTER FILE

Q.1 (a)	Enlist various stages of concreting.	05
(b)	Enlist all the physical tests performed on cement.	05
(c)	Explain the 'Fineness Modulus' of aggregates.	05
(d)	What is the 'segregation' in concrete? What are the factors affecting it? What remedial measures can prevent it?	05
Q.2 (a)	Write in short, the various types of chemical admixtures and their effect on concrete.	12
(b)	Discuss in detail, 'Sulphate Resisting Portland Cement'	08
Q.3 (a)	Discuss cold weather concreting. What are the problems associated with it? How can these problems be overcome?	10
(b)	What is Portland Pozzolana Cement (PPC)? What are its constituents? What are its advantages as compared to Ordinary Portland Cement (OPC)?	10
Q.4 (a)	Define workability of concrete? Enlist various workability tests performed on concrete. Explain any one test in detail.	12
(b)	Describe in detail, 'Self Compacting Concrete'.	08
Q.5 (a)	Explain in detail, Ultrasonic Pulse Velocity (UPV) Test on concrete.	10
(b)	What is a Ready Mix Concrete (RMC)? What are the components of RMC plant? Enlist the advantages of RMC over normal concrete.	10
Q.6 (a)	Enlist the various methods of compaction of concrete.	05
(b)	Design a concrete mix for compressive strength using the IS code method for the following data: (Use the tables attached on the next page for reference)	15

1. Grade of concrete: **M30**
2. Exposure: **severe**
3. Sand: **zone I**
4. Coarse Aggregate shape: **angular**
5. Maximum Aggregate Size: **20 mm**
6. Slump: **100 mm**
7. Specific Gravity of cement: **3.15**
8. Specific Gravity of Aggregates: **2.7**

Q.7   Write short notes on (**any four**) :

    (a)   Transit Mixer

    (b)   Fiber Reinforced Concrete

    (c)   Rebound Hammer Test

    (d)   High Strength Concrete

    (e)   High Density Concrete

    (f)   Carbonation.

Table 1 Assumed Standard Deviation

(Clauses 3.2.1.2, A-3 and B-3)

Sl No. (1)	Grade of Concrete (2)	Assumed Standard Deviation N/mm² (3)
i) ii)	M 10 } M 15 }	3.5
iii) iv)	M 20 } M 25 }	4.0
v) vi) vii) viii) ix) x)	M 30 } M 35 } M 40 } M 45 } M 50 } M 55 }	5.0

Table 2 Maximum Water Content per Cubic Metre of Concrete for Nominal Maximum Size of Aggregate

(Clauses 4.2, A-5 and B-5)

Sl No. (1)	Nominal Maximum Size of Aggregate mm (2)	Maximum Water Content[1] kg (3)
i)	10	208
ii)	20	186
iii)	40	165

Table 3 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate

(Clauses 4.4, A-7 and B-7)

Sl No. (1)	Nominal Maximum Size of Aggregate mm (2)	Zone IV (3)	Zone III (4)	Zone II (5)	Zone I (6)
i)	10	0.50	0.48	0.46	0.44
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.75	0.73	0.71	0.69

Table 2 Corrections

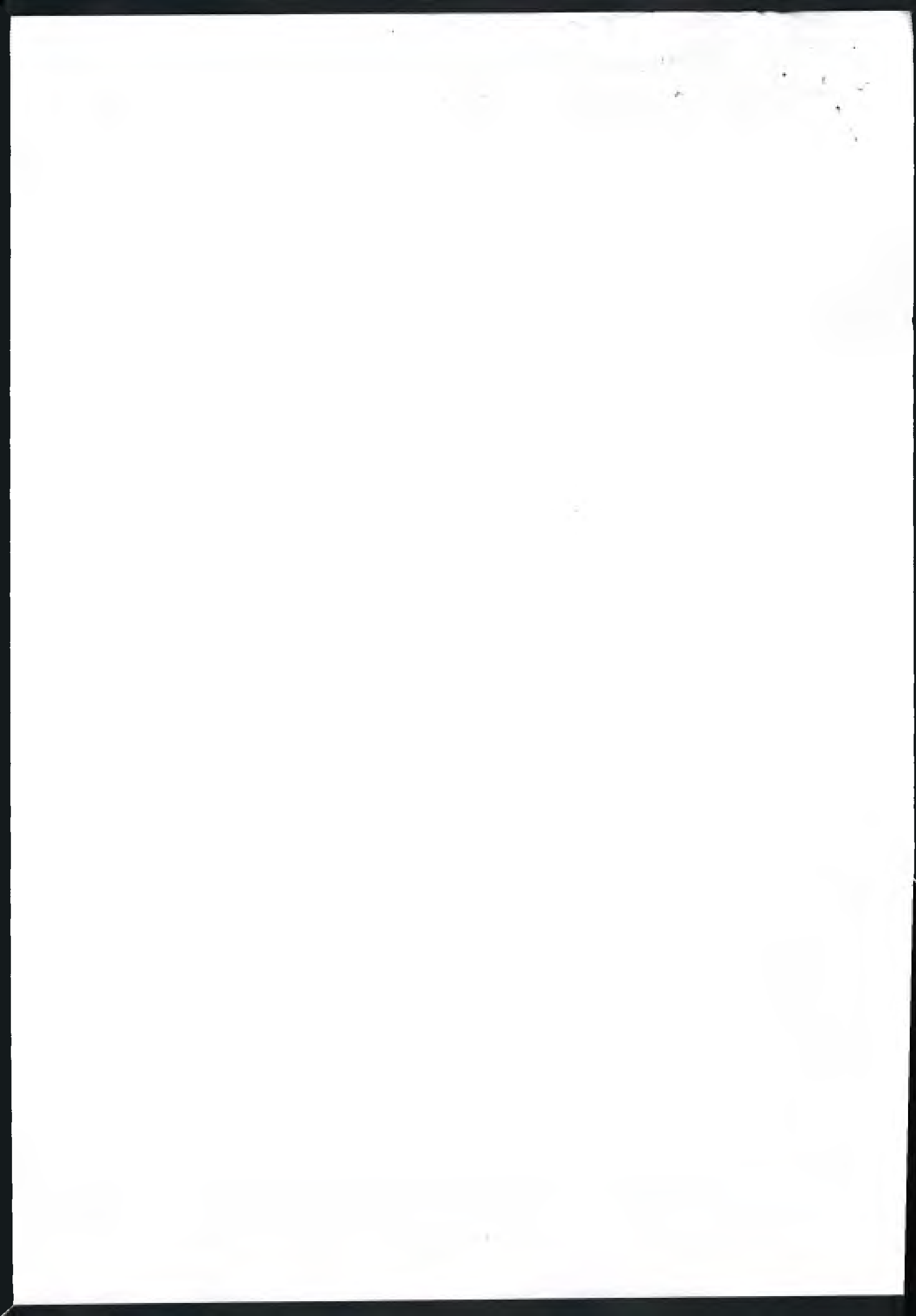slump: 3% increase in the maximum water content per 25 mm additional slump.

Table 3 Assumptions w/c = 0.5

Table 3 Corrections

∓ 0.01 per ± 0.05 change in w/c

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 and 9.1.2)

Sl No. (1)	Exposure (2)	Minimum Cement Content kg/m³ (6)	Maximum Free Water-Cement Ratio (7)	Minimum Grade of Concrete (8)
i)	Mild	300	0.55	M 20
ii)	Moderate	300	0.50	M 25
iii)	Severe	320	0.45	M 30
iv)	Very severe	340	0.45	M 35
v)	Extreme	360	0.40	M 40
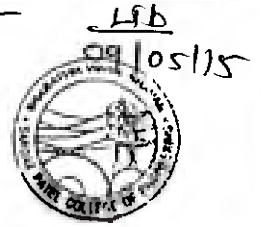
Table 6 Adjustments to Minimum Cement Contents for Aggregates Other Than 20 mm Nominal Maximum Size

(Clause 8.2.4.1)

Nominal Maximum Aggregate Size mm (2)	Adjustments to Minimum Cement Contents in Table 5 kg/m³ (3)
10	+40
20	0
40	-30

SARDAR PATEL COLLAGE OF ENGINEERING
[An Autonomous Institution Affiliated to University of Mumbai]

Class: S.E (CIVIL) [Sem: IV]
Subject: Fluid Mechanics

Exam: End Sem Exam   **Marks: 100. (3 hours.)**

Instructions: **DATE:**

1. Question no 1 is compulsory & attempt any four out of remaining six questions.
2. Illustrate answer with neat sketches wherever required.
3. Make suitable assumptions where necessary and state them clearly.   *Master*

Q.1. Write a short note on the following Terms (any Four)   (20 marks)

   a) Surface Tension   b) Meta centric Height

   c) Siphon spillway   d) Pitot tube

   e) Area-Velocity Relationship in Compressible fluids   f) Free Vortex flow

Q.2. a) Derive expression for Total pressure & Centre of pressure, when it acts on inclined plane surface

   under fully submerged conditions.   (8 marks)

   b) Write short note on Bourdon's pressure guage.   (6 marks)

   c) State & Prove Hydrostatic law when fluid is at rest.   (6 marks)

Q.3. a) Water is flowing vertically upwards through a pipeline having diameter 1 m & 0.5 m at the base&

   top respectively. The pressure at the lower end is 60.02 KN/m^2, while the pressure at the upper

   end is 20 KN/m^2. If the loss of head is 20% of difference in velocity head, calculate discharge. The

   difference in elevation/Datum head is 4 m.?   (6 marks)

   b) Explain the following terms with sketches.   (8 marks)

   1. Pathline.   2. Streamline   3. Streakline   4, Stream tube

   c) Explain the different types of fluid flows in fluid kinematics.   **(6 marks)**

Q.4. a) Derive an expression for an external cylindrical mouthpiece which proves, C_d of Mouthpiece is
more than Cd of Orifice. (Take $H_L = (V_c-V)^2 / 2g$)   **(8 Marks)**

   b) A 4 cm diameter orifice in the vertical side of the tank discharges water. The water surface in

page (1)

the tank is at constant level of 2 m above the centre of orifice. A fluid jet has diameter of 3.25

cm at its vena-contracta. The measured discharge is 5 lit/sec. determine C_c, C_v & C_d for the

orifice? **(6 marks)**

c) Explain the difference between notche & weir with sketches. What are the advantages of

triangular notch over the rectangular notch? **(6 Marks)**

Q.5. a) Explain a plain source in uniform flow (flow past half body). Also obtain expression for

Following terms: **(12 marks)**

   i.   Stream & Velocity potential function.
   ii.   Stagnation point.
   iii.   Shape of resultant flow.
   iv.   Location of stagnation point.

b) Discuss the following cases of Ideal flow with their equation of stream & velocity potential

function.   A) Uniform Flow   B) source flow **(8 Marks)**

Q.6. a) Prove the following statement, "The velocity of propagation of elastic wave in a compressible
fluid is equal to the velocity of sound in that fluid medium" **(8 Marks)**

b) Explain the following terms with neat sketches. **(6 Marks)**

   A) Mach Number B)   Mach Cone   C)   Mach Angle

c) Find the mach number when an aircraft is flying at 900 km/hr through still air having pressure
of 80 KN/m^2 & temperature of - 8 degree cel. Take R= 287.14 J/Kg.K. Calculate the pressure, density &
temp at stagnation point. Take K= 1.4 **(6 marks)**

Q.7. A) A rectangular tank 3 m wide, 3.5 m long & 2.5 m deep contains water to depth of 1.5 m. find the
horizontal acceleration which may be imparted to the tank in the direction of its length so that (a) there
is no spilling of water from the tank (b) the front bottom corner of the tank is just exposed (c) the
bottom of tank is exposed upto its mid-point. Calculate the volume of water that would spill out from
the tank in case of (b) & (c) Also calculate the total forces on each end of the tank in each of the cases
& show that difference between the forces equals the unbalanced force necessary to accelerate the
liquid mass in the tank. **(12 marks)**

B) What is relative equilibrium? a rectangular tank 3 m wide, 3.5 m long & 2.5 m deep contains
water to depth of 1.5 m. it is accelerated horizontally at 3 m/s^2 in the directions of its length. Find the
slope of free surface & the total force at back & front side of the tank. **(8 marks)**

SARDAR PATEL COLLAGE OF ENGINEERING
[An Autonomous Institution Affiliated to University of Mumbai]

Class: S.E (CIVIL) [Sem: IV]
Subject: Fluid Mechanics

Exam: Re- Exam   Marks: 100. (3 hours.)

Instructions: DATE:

1. Question no 1 is compulsory & attempt any four out of remaining six questions.
2. Illustrate answer with neat sketches wherever required.
3. Make suitable assumptions where necessary and state them clearly.   Master

Q.1. Write a short note on the following Terms (any Four)   (20 marks)

    a) Viscosity   b) Meta centre

    c) Rectangular notch   d) Bourdon pressure guage

    e) Source flow

Q.2. a) Derive expression for Total pressure & Centre of pressure, when it acts on vertical plane surface

        under fully submerged conditions.   (8 marks)

    b) Write short note on types of pressure.   (6 marks)

    c) State & Prove Pascal law when fluid is at rest.   (6 marks)

Q.3. a) Water is flowing vertically upwards through a pipeline having diameter 1 m & 0.5 m at the base&

        top respectively. The pressure at the lower end is 58.02 KN/m^2, while the pressure at the upper

        end is 22 KN/m^2. If the loss of head is 20% of difference in velocity head, calculate discharge. The

        difference in elevation/Datum head is 4 m.?   **(6 marks)**

    b) Explain the difference in methods of description of fluid in motion?   (8 marks)

    State the reason why streamline & pathline are identical to each other in steady flow?

    c) Explain the different types of fluid motion in fluid kinematics. (6 marks)

Q.4. a) Derive an expression for Hydraulic Coef. for external orifices? (8 Marks)

    b) A 4 cm diameter orifice in the vertical side of the tank discharges water. The water surface in

the tank is at constant level of 2.5 m above the centre of orifice. A fluid jet has diameter of 3

cm at its vena-contracta. The measured discharge is 7.5 lit/sec. determine C_c, C_v & C_d for the

orifice? (6 marks)

c) Derive the discharge equation for Triangular weir? (6 Marks)

Q.5. a) Explain a plain source in uniform flow (flow past half body). Also obtain expression for

Following terms: (12 marks)

i.   Stream & Velocity potential function.
ii.   Stagnation point.
iii.   Shape of resultant flow.
iv.   Location of stagnation point.

b) Discuss the following cases of Ideal flow with their equation of stream & velocity potential

function.   A) Uniform Flow   B) source flow (8 Marks)

Q.6. a) Prove the following statement, "The velocity of propagation of elastic wave in a compressible
fluid is equal to the velocity of sound in that fluid medium" (8 **Marks**)

b) Explain the following terms with neat sketches. (6 Marks)

A) Mach Number B)   Mach Cone   C)   Mach Angle

c) Find the mach number when an aircraft is flying at 760 km/hr through still air having pressure
of 70 KN/m^2 & temperature of - 11 degree cel. Take R= 287.14 J/Kg.K. Calculate the pressure,density &
temp at stagnation point. Take K= 1.4 (**6** marks)

Q.7. A) A rectangular tank 3 m wide, 2.5 m long & 1.5 m deep contains water to depth of 1.5 m. find the
horizontal acceleration which may be imparted to the tank in the direction of its length so that (a) there
is no spilling of water from the tank (b) the front bottom corner of the tank is just exposed (c) the
bottom of tank is exposed upto its mid-point. Calculate the volume of water that would spill out from
the tank in case of (b) & (c)   Also calculate the total forces on each end of the tank in each of the cases
& show that difference between the forces equals the unbalanced force necessary to accelerate the
liquid mass in the tank. (12 marks)

B) What is relative equilibrium? a rectangular tank 3 m wide, 3.5 m long & 2.0 m deep contains
water to depth of 1.5 m. it is accelerated horizontally at 2.5 m/s^2 in the directions of its length. Find the
slope of free surface & the total force at back & front side of the tank. (8 marks)

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SARDAR PATEL COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to University of Mumbai)

June 2015

Total Marks: 100   Duration: **3 Hours**

CLASS/SEM: <u>**S.E (CIVIL)/IV**</u> (RE-EXAMINATION)   SUBJECT: <u>**APPLIED MATHEMATICS IV**</u>

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicate full marks.

Master

Q1.a) Find the analytic function whose real part is $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ 06

Q1.b) To verify whether a course in accounting improved performance, a similar test was given to   06
12 participants both before and after the course. The original marks recorded in alphabetical
order of the participants were 44, 40, 61, 52, 32, 44, 70, 41, 67, 72, 53 and 72. After the
course, the marks were in the same order 53, 38, 69, 57, 46, 39, 73, 48, 73, 74, 60 & 78.
Was the course useful?

Q1.c) A furniture maker has 6 units of wood & 28 hours of free time, in which he will make   08
decorative screens. Two models have sold well in the past, so he will restrict himself to those
two. He estimates that model I requires 2 units of wood and 1 hour of time, while model II
requires 1 unit of wood & 8 hours of time. The prices of the models are $ 120 & $ 80
respectively. How many screens of each model should the furniture maker assemble if he
wishes to maximize his sales revenue. Formulate the above problem as an LPP & solve it by
graphical method

Q2.a) If the mean of a binomial distribution is 3 and the variance is $\frac{3}{2}$, find the probability of   06
obtaining atleast 4 success.

Q2.b) Find the bilinear transformation which maps $z = 2, 1, 0$ onto $w = 1, 0, i$ 06

Q2.c) Find the image of the circle $|z - 1| = 1$ in the complex plane under the mapping $w = \frac{1}{z}$.   08

Q3.a) Evaluate $\int (x + 3iy)dz$ along the straight line joining $z = 0$ to $z = 1 - i$.   06

Q3.b) The probability that a smoker aged 25 years will die before reaching the age of 30 years may   06
be taken a 0.018. Out of a group of 400 smokers, now aged 25 years, what is the probability
that 2 smokers will die within the next 5 years?

Q3.c) Solve the following LPP using Simplex method   08

page - ①

$$\text{Maximize } Z = 3x_1 + 2x_2 + 5x_3$$
$$\text{Subject to } x_1 + x_2 + x_3 \leq 430$$
$$3x_1 + 2x_3 \leq 460$$
$$x_1 + 4x_2 \leq 420$$
$$(x_1, x_2, x_3 \geq 0)$$

06

Q4.a) Evaluate $\oint \dfrac{e^{-z}}{z^2} dz$ \qquad $c : |z| = 1$

06

Q4.b) Evaluate using residue theorem $\oint \dfrac{2z-1}{z(z+1)(z-3)} dz$ where C is the circle $|z| = 2$

Q4.c) In a distribution exactly 7% of items are under 35 and 89% are under 63. What are the mean and standard deviation? 08

06

Q5.a) Compute spearman's rank coorelation coefficient for the following data

X	18	20	34	52	12
Y	39	23	35	18	46

06

Q5.b) Use residue calculus to evaluate the following integral

$$\int_0^{2\pi} \frac{1}{5 - 4\sin\theta} d\theta$$

Q5.c) In an examination marks obtained by students in mathematics, physics and chemistry are normally distributed with means 51,53 and 46 with standard deviations 15,12,16 respectively. Find the probability of securing total marks (i) 180 or more (ii) 90 or below 08

Q6.a) For a random sample of 10 pigs fed diet A, the increases in weight in pounds in a certain 06 period were 10, 6, 16, 17, 13, 12, 8, 14, 15, 9.
For another random sample of 12 pigs, fed on diet B, the increase in the same period were 7, 13, 22, 15, 12, 14, 18, 8, 21, 23, 10, 17. Test whether the diets A & B differ significantly as regards their effect on increase in weight

06

Q6.b) Evaluate $\displaystyle\int_{-\infty}^{\infty} \frac{x^2 \, dx}{(x^2 + 1)(x^2 + 4)}$ using residue theorem.

08

Q6.c) Calculate the correlation coefficient for the following data:

| X	9	8	7	6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

Q7.a) Fit a binomial distribution for the following data and compare the theoretical frequencies with 06 the actual ones:

2

page

X	0	1	2	3	4	5
f(x)	2	14	20	34	22	8

Q7.b) Find the image of the area between $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$ in the z–plane into the w– plane under the transformation $w = \log z$ 06

Q7.c) The theory predicts the proportions of bean in the four groups A, B, C & D should be 9:3:3:1.   08
In an experiment among 1600 beans, the number in the four group are 882, 313, 287 & 118.
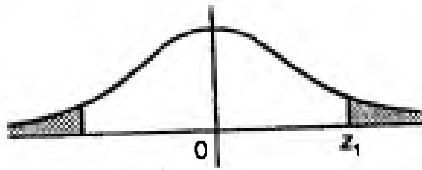Does the experimental result support the theory?

page -(1)

Applied Mathematics - IV
(Civil / Const. / Prod.)

(I)

Statistical Tables

Area Under Standard Normal Curve
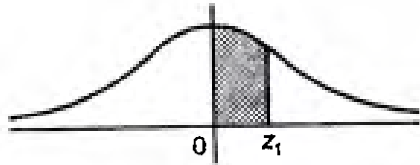
The table gives the area under the standard normal curve from $z = 0$ to $z = z_1$ which is the probability that z will lie between $z = 0$ and $z = z_1$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.8832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2703	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4841	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4560	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Applied Mathematics - IV
(Civil / Const. / Prod.)

(II)

Statistical Tables

Percentage Points of *t*- distribution

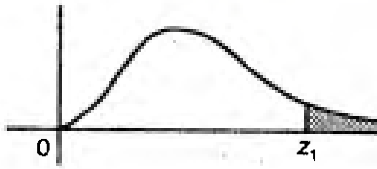**Example**

For $\Phi = 10$ d. o. f.

$P (| t | > 1.812) = 0.1$

Φ \ P	0.20	0.10	0.05	0.02	0.01
1	3.078	6.314	12.706	31.812	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.287
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.325	2.576

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Applied Mathematics - IV
(Civil / Const. / Prod.)   (III)   **Statistical Tables**

Percentage Points of χ^2 - Distribution

Example

For $\Phi = 10$ d. o. f.

$P(\chi^2 > 15.99) = 0.10$

Φ \ P	0 = .99	0.95	0.50	0.10	0.05	0.02	0.01
1	.000157	.00393	.455	2.706	3.841	5.214	6.635
2	.0201	.103	1.386	4.605	5.991	7.824	9.210
3	.115	.352	2.366	6.251	7.815	9.837	11.341
4	.297	.711	3.357	7.779	9.488	11.668	13.277
5	.554	1.145	4.351	9.236	11.070	13.388	15.086
6	.872	1.635	5.348	10.645	12.592	15.033	16.812
7	1.339	2.167	6.346	12.017	14.067	16.622	18.475
8	1.646	2.733	7.344	13.362	15.507	18.168	20.090
9	2.088	3.325	8.343	14.684	16.919	19.679	21.666
10	2.558	3.940	9.340	15.987	18.307	21.161	23.209
11	3.053	4.575	10.341	17.275	19.675	22.618	24.725
12	3 571	5.226	11.340	18.549	21.026	24.054	26.217
13	4.107	5.892	12.340	19.812	22.362	25.472	27.688
14	4.660	6.571	13.339	21.064	23.685	26.873	29.141
15	4.229	7.261	14.339	22.307	24.996	28.259	30.578
16	5.812	7.962	15.338	23.542	26.296	29.633	32.000
17	6.408	8.672	16.338	24.769	27.587	30.995	33.409
18	7.015	9.390	17.338	25.989	28.869	32.346	34.805
19	7.633	10.117	18.338	27.204	30.144	33.687	36.191
20	8.260	10.851	19.337	28.412	31.410	35.020	37.566
21	8.897	11.591	20.337	29.615	32.671	36.349	38.932
22	9.542	12.338	21.337	30.813	33.924	37.659	40.289
23	10.196	13.091	22.337	32.007	35.172	38.968	41.638
24	10.856	13.848	23.337	32.196	36.415	40.270	42 980
25	11.524	14.611	24.337	34.382	37.652	41.566	44.314
26	12.198	15.379	25.336	35.363	38.885	41.856	45.642
27	12.879	16.151	26.336	36.741	40.113	44.140	46.963
28	13.565	16.928	27.336	37.916	41.337	45.419	48.278
29	14.256	17.708	28.336	39.087	42.557	46.693	49.588
30	14.953	18 493	29.336	40.256	43.773	47.962	50.892