

Registration Number

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INDIAN INSTITUTE OF HANDLOOM TECHNOLOGY

Bargarh/Fulia/Guwahati/Jodhpur/Salem/Varanasi/Champa/Kannur/KHTI-Gadag/SPKM-Venkatagiri

Diploma in Handloom & Textile Technology

NOV/DEC-2023 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 02

Time:3 Hours

Course Code &Title : **BS102 Mathematics - II**

Maximum Marks:100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

1. If $A = \begin{bmatrix} 3 & 2 & 1 \\ 0 & 1 & -2 \\ 1 & 3 & 4 \end{bmatrix}$ find $|A|$.
2. If $A = \begin{bmatrix} 3 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 2 & 1 \\ 3 & 1 \end{bmatrix}$ find AB .
3. Evaluate $\int x(x-1)^2 dx$.
4. Evaluate $\int \sin 7x dx$.
5. Find the equation of the circle with centre $(2,-3)$ and radius $\sqrt{7}$.
6. Show that the equation $4x^2 + 10xy + y^2 - 2x + 5y - 3 = 0$ represents a hyperbola.
7. If $\vec{a} = 5\vec{i} + 2\vec{j} - 3\vec{k}$ and $\vec{b} = -3\vec{i} - 2\vec{j} + 5\vec{k}$ find $3\vec{a} + 2\vec{b}$.
8. If \vec{a} and \vec{b} are any two vectors such that $|\vec{a}| = 6$, $|\vec{b}| = 4$, and $\vec{a} \cdot \vec{b} = 12$ find the angle between them.
9. Define Type I and II error.
10. What is the assumption of t-test?

PART-B

(6+10)×5=80 Marks)

Answer all the questions in detail

11. A. Verify $(AB)^T = B^T A^T$ where $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 2 & 0 \\ -1 & 1 \end{bmatrix}$ (6)
B. Find the inverse of $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 4 \\ 0 & 2 & 2 \end{bmatrix}$ (10)

(OR)

C. Find x and y when $\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$ (6)

Solve the equations by Cramer's rule. (10)

D. $2x + 2y + z = 1, x - y + 6z = 21, 3x + 2y - z = -4$

12. A. Evaluate $\int x e^{x^2} dx$ (6)

B. Evaluate $\int x \log x dx$ (10)

(OR)

C. Evaluate $\int_2^3 \frac{1}{x^3} dx$ (6)

D. Evaluate $\int_0^{\frac{\pi}{2}} \cos^3 x dx$ (10)

13. A. Find the value of p for which the points $(-1, 3), (2, p)$ and $(5, -1)$ are collinear. (6)

B. Find the equation of parabola whose focus is $(-1, -2)$ and directrix is $x - 2y + 3 = 0$. (10)

(OR)

C. Given an ellipse whose foci are at $(\pm 4, 0)$ and the eccentricity is $\frac{1}{3}$. Find the equation of the ellipse. (6)

D. Find the equation of a parallel line and a perpendicular line passing through the point $(1, 2)$ to the line $3x + 4y = 7$. (10)

14. A. Find the value of 'm' if the vectors $4\vec{i} + 7\vec{j} - 3\vec{k}$ and $m\vec{i} + 2\vec{j} - 6\vec{k}$ are perpendicular. (6)

B. Find the angle between the vectors $-2\vec{i} - \vec{j} - \vec{k}$ and $4\vec{i} + 7\vec{j} + 3\vec{k}$. (10)

(OR)

C. Find $(\vec{a} + \vec{b}) \cdot (2\vec{b} - \vec{a})$ if $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} - \hat{k}$ (6)

D. Find the work done by the force $2\vec{i} + \vec{j} + \vec{k}$ acting on the particle, if the particle is displaced from $4\vec{i} + \vec{j} - 3\vec{k}$ to the point $5\vec{i} + 4\vec{j} + 2\vec{k}$ (10)

15. A. A normal population has a mean of 6.48 and s.d of 1.5. In a sample of 400 members mean is 6.75. Is the difference significant? (6)

- B. Find the value of Chi-square test (10)

Class	A	B	C	D	E	F
Observed frequency	15	45	85	95	60	20
Expected frequency	9.6	51.2	99.2	99.2	51.2	9.6

(OR)

- C. A machinist is making engine parts with axle diameters of 0.7 inch. A random sample of 10 parts shows a mean diameter of 0.742 inch with a standard deviation of 0.04 inch. Compute the statistic you would use to test, whether the work is meeting the specification. (6)

- D. Two random samples give the following results. (10)

Sample	Size	Sample mean	Sum of squares of deviations from the mean
I	10	15	90
II	12	14	108

Find if the variances are significantly different.

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Diploma in Handloom & Textile Technology

NOV/DEC-2023 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 02

Time:3 Hours

Course Code & Title : **BS103 APPLIED PHYSICS**

Maximum Marks: 100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

1. Write down the dimensional formula of Force.
2. What are fundamental quantities.
3. What is Stress? Write down its unit.
4. Define Viscosity.
5. Convert 30 °C into Kelvin scale.
6. Write down the relation between Fahrenheit and Celsius temperature.
7. Define amplitude.
8. Write down the relation between frequency and wavelength.
9. Define electric current. Write down its unit.
10. What are semiconductors?

PART-B

((6+10)×5=80 Marks)

Answer all the questions in detail

11. A. State the principal of Homogeneity. (6)
B. Prove that $S = ut + \frac{1}{2}at^2$ is dimensionally correct. (10)
(OR)
C. What is derived physical quantity? Give two examples of it with their dimensions. (6)
D. Convert 50 Joules into ergs using dimensions. (10)
12. A. State the Stokes's law. Write down its assumptions. (6)
B. Define Friction. Explain different types of Friction in details. (10)
(OR)
C. State Hooke's law. Write down its application. (6)

D. Explain stress-strain curve with a neat sketch. (10)

13. A. Explain the three distinct modes of heat transfer. (6)

B. State the relation among co-efficient of linear, surface and cubical expansions (10)

(OR)

C. Explain about Thermal Expansion. (6)

D. At 30° C, the area of a sheet of aluminum is 40 cm² and the coefficient of linear expansion is $24 \times 10^{-6} \text{C}^{-1}$. Determine the final temperature if the final area is 40.2 cm². (10)

14. A. Explain the following terms with an example: - (6)

(a) Free Vibration, (b) Damped Vibration, (c) Forced Vibration

B. Define transverse wave and longitudinal wave with example and neat diagram. (10)

(OR)

C. What is Total Internal Reflection? Write down the conditions for Total Internal Reflection. (6)

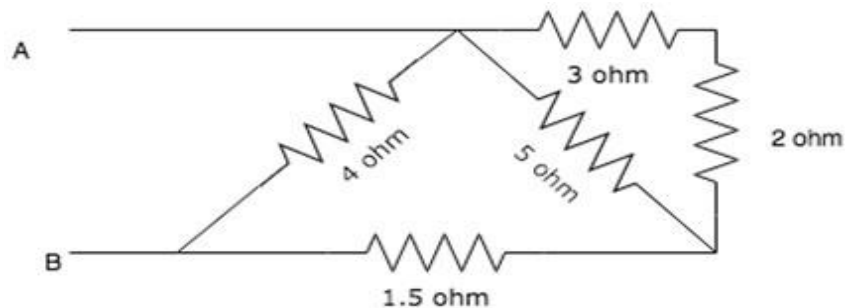
D. An object is placed at a distance of 50 cm from a concave lens of focal length 20 cm. Find the nature and position of the image. (10)

15. A. Explain in details Kirchhoff's Voltage and Current law. (6)

B. Derive the equation for equivalent capacitance, when the capacitors are connected in series and parallel. (10)

(OR)

C. Find the resultant resistance between point A and point B in the following circuit: (6)



D. Explain the construction and working of NPN transistor. (10)

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NOV/DEC-2023 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 02

Time:3 Hours

Course Code & Title : **ES102 INTRODUCTION TO IT SYSTEM**

Maximum Marks: 100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

1. What is search engine? Give any two examples.
2. What are the basic differences between volatile and non-volatile memory?
3. List out some important HTML elements.
4. Define image tag with an example.
5. What is software? How it differs from hardware? Why software is needed?
6. Define Operating System and give some open source operating systems available in the market.
7. Differentiate between Linux and Windows Operating system.
8. List various directory management commands in Linux.
9. What are the rules for declaring a variable? Give an example.
10. Differentiate between entry-controlled loop and exit controlled loop.

PART-B

((6+10)×5=80 Marks)

Answer all the questions in detail

11. A. Discuss about primary memory and its types in detail. (6)
B. Draw the architecture of a computer system and explain its major components. (10)

(OR)

- C. Write short notes on secondary storage devices. (6)
D. How computers are classified? Explain its types in detail. (10)
12. A. Write features of Windows Operating system. (6)
B. With an example explain any five file management commands in Linux. (10)

(OR)

- C. Bring out the important features of Linux operating system than Unix. (6)
- D. With an example explain any five General purpose commands in Linux. (10)

- 13. A. Explain the structure of the HTML webpage with an example. (6)
- B. How to set the width and height of an image using HTML ? (10)

(OR)

- C. Explain about Cascading Style Sheets with an example (6)
- D. How to set Background Color in HTML? (10)

- 14. A. What is power point presentation? Explain its features. (6)
- B. How MS Word is different from MS Excel? Explain various features of MS Word. (10)

(OR)

- C. Explain spreadsheet? Write the features of MS Excel. (6)
- D. Describe and discuss MS office suits. (10)

- 15. A. Explain various operators available in C language with examples. (6)
- B. Write a program to check whether the given year is leap year or not. (10)

(OR)

- C. Explain various data types available in C language with examples. (6)
- D. Write a C program to print all even numbers from 1 to 100. (10)

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NOV/DEC-2023 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 02 Time:3 Hours
Course Code &Title : ES104-Fundamentals of Electrical,
Electronics Engineering Maximum Marks:100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

1. Compare Active and Passive components.
2. Draw the symbol of AND & OR Gate.
3. Define Slew rate.
4. Mention the applications of Op-Amp.
5. State Faraday's Law.
6. Distinguish EMF and MMF.
7. Draw a Power Triangle.
8. What do you mean by Cycle and Frequency?
9. Mention the applications of Motor in Textile Industries.
10. Define Transformation Ratio.

PART-B

(6+10)×5=80 Marks)

Answer all the questions in detail

11. A. Differentiate Diode and Transistor. (6)
B. Explain the working principle and characteristics of PN Junction Diode with suitable diagram. (10)
- (OR)
- C. Discuss about the different types of Waveforms. (6)
D. Construct the state table and explain the operation of Ripple Counter. (10)
12. A. Compare Open loop and Closed loop configuration of Op-Amp. (6)
B. Explain in details about Half adder and Full adder. (10)

(OR)

- C. Compare the ideal and practical Op-Amp. (6)
- D. What do you mean by inverting amplifier? Derive the expression for its output voltage. (10)
13. A. Brief the following terms i) EMF ii) Current iii) Power. (6)
- B. Differentiate Electric and Magnetic circuit. (10)
- (OR)**
- C. Explain in detail about the Hysteresis loop with suitable sketch. (6)
- D. Describe about i) Self & Mutual inductance ii) Statically and Dynamically induced EMF. (10)
14. A. Define i) RMS Value ii) Form Factor iii) Power factor. (6)
- B. Determine the Voltage and Current relationship in Star and Delta Connection with neat sketch. (10)
- (OR)**
- C. Give the phasor representation of AC through pure Resistor, Inductor and Capacitor. (6)
- D. Explain series R-C circuit with phasor diagram and derive equation of resonance frequency (f_r). (10)
15. A. Draw the characteristics curves of various types of DC Motors. (6)
- B. Explain the construction and working principle of Squirrel Cage Induction Motor. (10)
- (OR)**
- C. Briefly explain about Auto transformer. (6)
- D. Explain the construction and working principle of Transformer and also derive the EMF equation with suitable diagram. (10)

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NOV/DEC-2023 SEMESTER EXAMINATION

(Regulation-2021)

Semester : 02 Time:3 Hours

Course Code & Title : **ES106-ENGINEERING MECHANICS** Maximum Marks: 100

PART-A

(10×2=20 Marks)

Answer all the questions within two to three sentences

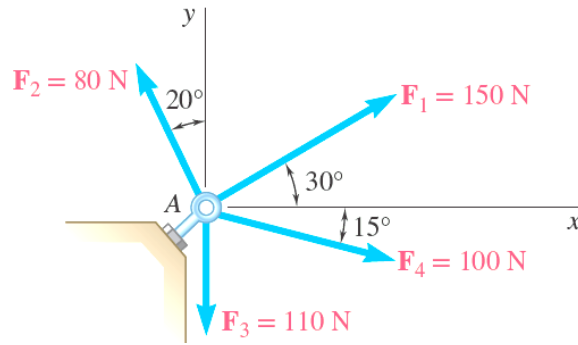
1. Two equal forces are acting at a point with an angle of 60° between them. If the resultant force is equal to $20 \times \sqrt{3}$ N, find magnitude of each force.
2. Differentiate the couple and the moment.
3. State the conditions for static equilibrium of a two force planar member.
4. Illustrate with simple sketch, the different types of loads acting on a beam.
5. Define the following terms: (i) Co-efficient of friction, (ii) Angle of friction.
6. State any four applications of friction.
7. List the different methods that are used to find the centroid of plane figures.
8. Specify the significance of Centre of gravity of planar geometries.
9. Define the term 'mechanical advantage'.
10. What are reversible and non-reversible machines?

PART-B

((6+10)×5=80 Marks)

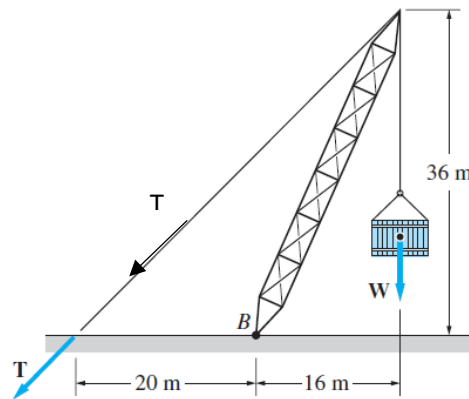
Answer all the questions in detail

11. A. Four forces equal to P, 2P, 3P and 4P are respectively acting along the four sides of square ABCD taken in order. Find the magnitude, direction and position of the resultant force (6)
B. Four forces act on bolt, A as shown in Fig. Determine the resultant of the forces on the bolt (10)

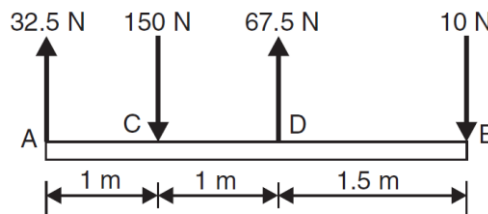


(OR)

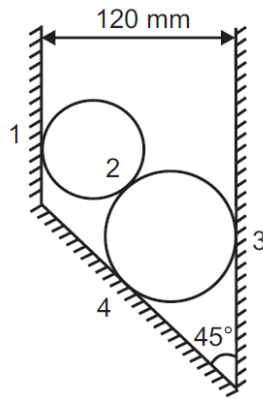
- C. Given that $T = 28.3\text{ kN}$ and $W = 25\text{ kN}$, determine the magnitude and sense of the moments about point B of the following: (i) the force, T; (ii) the weight, W. (6)



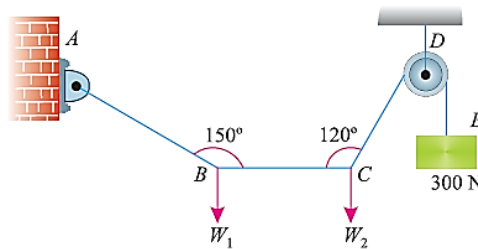
- D. A system of parallel forces is acting on a rigid bar as shown in Fig. Reduce this system to: (10)
- a single force
 - a single force and a couple at A



12. A. Two cylinders of diameters 100 mm and 50 mm , weighing 200 N and 50 N , respectively are placed in a trough as shown in Fig. Neglecting friction, find the reactions at contact surfaces 1, 2, 3 and 4. (6)

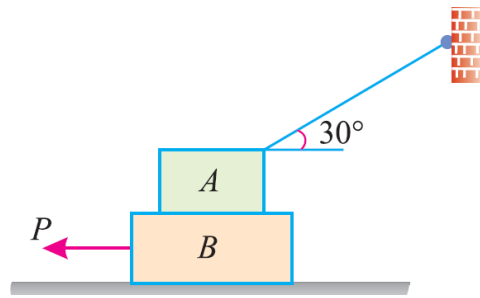


- B. A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Fig. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, find (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W_1 and W_2 . (10)



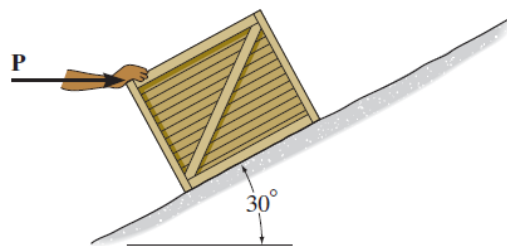
(OR)

- C. A 12-m long cantilever beam carries a point load of 40 kN at 3 m from the fixed end and a uniformly distributed load of 10 kN/m for a span of 6 m from the free end of the beam. Find the support reactions in the beam. (6)
- D. A simply supported beam has a span of 9 m and carries a uniformly distributed load of 20 kN/m over a length of 5 m from the left end support. It also carries two point loads of 30 kN and 40 kN at 6 m and 8 m respectively from the left end support. Find the support reactions in the beam. (10)
13. A. State the laws of static and dynamic friction. (6)
- B. Two blocks A and B of weights 1 kN and 2 kN respectively are in equilibrium position as shown in Fig. If the coefficient of friction between the two blocks as well as the block B and the floor is 0.3, find the force (P) required to move the block B (10)



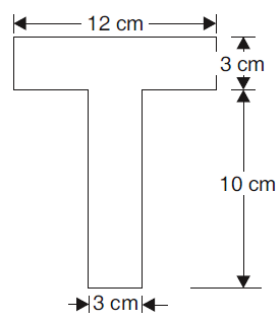
(OR)

- C. Determine the minimum force, P required to push the crate up the plane. The crate has a mass of 50 kg and the coefficient of static friction between the crate and the plane, $\mu = 0.25$. (6)

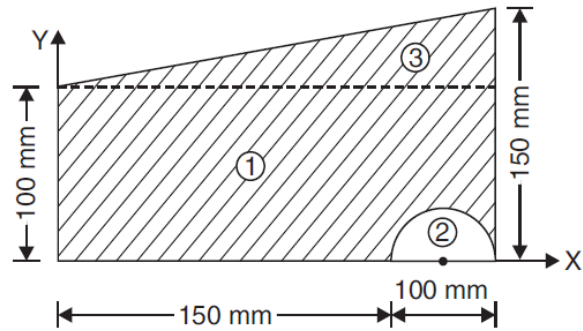


- D. An effort of 200 N is required just to move a certain body up an inclined plane of angle 15° the force acting parallel to the plane. If the angle of inclination of the plane is made 20° the effort required, again applied parallel to the plane, is found to be 230 N. Find the weight of the body and the coefficient of friction. (10)

14. A. Find the centre of gravity of the T-section shown in Fig. (6)

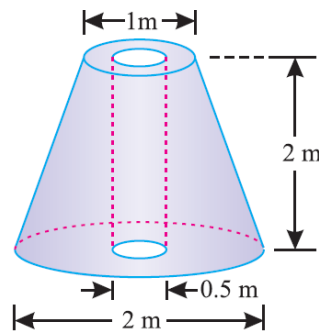


- B. A semi-circular area is removed from the trapezoid as shown in Fig. (10)
Determine the centroid of the remaining area.



(OR)

- C. A frustum of a solid right circular cone has an axial hole of 50 cm diameter as shown in Fig. Determine the centre of gravity of the body. (6)



- D. A right circular cylinder of 120 mm diameter is joined with a hemisphere of the same diameter face to face. Find the greatest height of the cylinder, so that centre of gravity of the composite section coincides with the plane of joining the two sections. The density of the material of hemisphere is twice that the material of cylinder. (10)
15. A. In a lifting machine in which velocity ratio is 30, a load of 5000 N is lifted with an effort of 360 N. Determine whether it is self-locking or reversible machine. How much is the frictional resistance? (6)
- B. In a lifting machine, an effort of 500 N is to be moved by a distance of 20 m to raise a load of 10,000 N by a distance of 0.8 m. Determine the velocity ratio, mechanical advantage and efficiency of the machine. Determine also ideal effort, effort lost in friction, ideal load and frictional resistance (10)

(OR)

- C. A screw jack raises a load of 40 kN. The screw is square threaded having three threads per 20 mm length and 40 mm in diameter. Calculate the force required at the end of a lever 400 mm long measured from the axis of the screw, if the coefficient of friction between screw and nut is 0.12. (6)

- D. In a wheel and axle, diameter of the wheel is 500 mm and that of the axle is 200 mm. The thickness of the cord on the wheel is 6 mm and that of the axle is 20 mm. Find the velocity ratio of the machine. If the efficiency when lifting a load of 1200 N with a velocity of 10 m/min is 70%, find the effort necessary. (10)

BS102 – Applied Mathematics - II

Values of $F_{0.05}$

ν_2 = Degrees of freedom for denominator	ν_1 = Degrees of freedom for numerator																		
	1	2	3	4	5	6	7	8	9	10	12	15	20	25	30	40	60	120	∞
1	161	200	216	225	230	234	237	239	241	242	244	246	248	249	250	251	252	253	254
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.46	19.47	19.48	19.49	19.50	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.63	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.52	4.50	4.46	4.43	4.40	4.37
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.83	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.40	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.11	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.89	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.73	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.60	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.50	2.47	2.38	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.39	2.34	2.31	2.27	2.22	2.18
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.34	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.28	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.23	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.18	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.14	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.07	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.02	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.00	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.97	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.88	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.78	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.69	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.60	1.55	1.50	1.43	1.35	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.51	1.46	1.39	1.32	1.22	1.00

Values of $F_{0.01}$

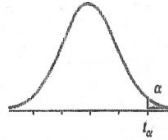
ν_2 = Degrees of freedom for denominator	ν_1 = Degrees of freedom for numerator																		
	1	2	3	4	5	6	7	8	9	10	12	15	20	25	30	40	60	120	∞
1	4.052	5.000	5.403	5.625	5.764	5.859	5.928	5.982	6.023	6.056	6.106	6.157	6.209	6.240	6.261	6.287	6.313	6.339	6.366
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40	99.42	99.43	99.45	99.46	99.57	99.47	99.48	99.49	99.50
3	34.12	30.82	29.46	28.24	27.91	27.67	27.49	27.35	27.23	27.05	26.87	26.69	26.58	26.50	26.41	26.32	26.22	26.13	26.03
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55	14.37	14.20	14.02	13.91	13.84	13.75	13.65	13.56	13.46
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05	9.89	9.72	9.55	9.45	9.38	9.29	9.20	9.11	9.02
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.72	7.56	7.40	7.30	7.23	7.14	7.06	6.97	6.88
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.47	6.31	6.16	6.06	5.99	5.91	5.82	5.74	5.65
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.67	5.52	5.36	5.26	5.20	5.12	5.03	4.95	4.86
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	5.11	4.96	4.81	4.71	4.65	4.57	4.48	4.40	4.31
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.71	4.56	4.41	4.31	4.25	4.17	4.08	4.00	3.91
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.40	4.25	4.10	4.01	3.94	3.86	3.78	3.69	3.60
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.16	4.01	3.86	3.76	3.70	3.62	3.54	3.45	3.36
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	3.96	3.82	3.66	3.57	3.51	3.43	3.34	3.25	3.17
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.80	3.66	3.51	3.41	3.35	3.27	3.18	3.09	3.00
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.67	3.52	3.37	3.28	3.21	3.13	3.05	2.96	2.87
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.55	3.41	3.26	3.16	3.10	3.02	2.93	2.84	2.75
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.46	3.31	3.16	3.07	3.00	2.92	2.83	2.75	2.65
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.37	3.23	3.08	2.98	2.92	2.84	2.75	2.66	2.57
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.30	3.15	3.00	2.91	2.84	2.76	2.67	2.58	2.49
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37	3.23	3.09	2.94	2.84	2.78	2.69	2.61	2.52	2.42
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31	3.17	3.03	2.88	2.79	2.72	2.64	2.55	2.46	2.36
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26	3.12	2.98	2.83	2.73	2.67	2.58	2.50	2.40	2.31
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21	3.07	2.93	2.78	2.69	2.62	2.54	2.45	2.35	2.26
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17	3.03	2.89	2.74	2.64	2.58	2.49	2.40	2.31	2.21
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13	2.99	2.85	2.70	2.60	2.54	2.45	2.36	2.27	2.17
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.84	2.70	2.55	2.45	2.39	2.30	2.21	2.11	2.01
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.66	2.52	2.37	2.27	2.20	2.11	2.02	1.92	1.80
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50	2.35	2.20	2.10	2.03	1.94	1.84	1.73	1.60
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34	2.19	2.03	1.93	1.86	1.76	1.66	1.53	1.38
∞	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.18	2.04	1.88	1.77	1.70	1.59	1.47	1.32	1.00

t-Table

ν	Probability				
	0.9	0.1	0.05	0.02	0.01
1	0.158	6.314	12.706	31.821	63.657
2	0.142	2.920	4.303	6.965	9.925
3	0.137	2.353	3.182	4.541	5.841
4	0.134	2.132	2.776	3.747	4.604
5	0.132	2.015	2.571	3.365	4.032
6	0.131	1.943	2.447	3.143	3.707
7	0.130	1.895	2.365	2.998	3.496
8	0.130	1.860	2.306	2.896	3.355
9	0.129	1.833	2.262	2.821	3.250
10	0.129	1.812	2.228	2.764	3.169
11	0.129	1.796	2.201	2.718	3.106
12	0.128	1.782	2.179	2.681	3.055
13	0.128	1.771	2.160	2.650	3.012
14	0.128	1.761	2.145	2.624	2.977
15	0.128	1.753	2.131	2.602	2.947
16	0.128	1.746	2.120	2.583	2.921
17	0.128	1.740	2.110	2.567	2.898
18	0.127	1.734	2.101	2.552	2.878
19	0.127	1.729	2.093	2.539	2.861
20	0.127	1.725	2.086	2.528	2.845
21	0.127	1.721	2.080	2.518	2.831
22	0.127	1.717	2.074	2.508	2.819
23	0.127	1.714	2.069	2.500	2.807
24	0.127	1.711	2.064	2.492	2.797
25	0.127	1.708	2.060	2.485	2.787
30	0.127	1.697	2.042	2.457	2.750
40	0.126	1.684	2.021	2.423	2.704
60	0.126	1.671	2.000	2.390	2.660
120	0.126	1.658	1.980	2.358	2.617
∞	0.126	1.645	1.960	2.326	2.576

STATISTICAL TABLES

Values of t_{α}



v	$\alpha = 0.10$	$\alpha = 0.05$	$\alpha = 0.025$	$\alpha = 0.01$	$\alpha = 0.00833$	$\alpha = 0.00625$	$\alpha = 0.005$	v
1	3.078	6.314	12.706	31.821	38.204	50.923	63.657	1
2	1.886	2.920	4.303	6.965	7.650	8.860	9.925	2
3	1.638	2.353	3.182	4.541	4.857	5.392	5.841	3
4	1.533	2.132	2.776	3.747	3.961	4.315	4.604	4
5	1.476	2.015	2.571	3.365	3.534	3.810	4.032	5
6	1.440	1.943	2.447	3.143	3.288	3.521	3.707	6
7	1.415	1.895	2.365	2.998	3.128	3.335	3.499	7
8	1.397	1.860	2.306	2.896	3.016	3.206	3.355	8
9	1.383	1.833	2.262	2.821	2.934	3.111	3.250	9
10	1.372	1.812	2.228	2.764	2.870	3.038	3.169	10
11	1.363	1.796	2.201	2.718	2.820	2.961	3.106	11
12	1.356	1.782	2.179	2.681	2.780	2.934	3.055	12
13	1.350	1.771	2.160	2.650	2.746	2.896	3.012	13
14	1.345	1.761	2.145	2.624	2.718	2.864	2.977	14
15	1.341	1.753	2.131	2.602	2.694	2.837	2.947	15
16	1.337	1.746	2.120	2.583	2.673	2.813	2.921	16
17	1.333	1.740	2.110	2.567	2.655	2.793	2.898	17
18	1.330	1.734	2.101	2.552	2.639	2.775	2.878	18
19	1.328	1.729	2.093	2.539	2.625	2.759	2.861	19
20	1.325	1.725	2.086	2.528	2.613	2.744	2.845	20
21	1.323	1.721	2.080	2.518	2.602	2.732	2.831	21
22	1.321	1.717	2.074	2.508	2.591	2.720	2.819	22
23	1.319	1.714	2.069	2.500	2.582	2.710	2.807	23
24	1.318	1.711	2.064	2.492	2.574	2.700	2.797	24
25	1.316	1.708	2.060	2.485	2.566	2.692	2.787	25
26	1.315	1.706	2.056	2.479	2.559	2.684	2.779	26
27	1.314	1.703	2.052	2.473	2.553	2.676	2.771	27
28	1.313	1.701	2.048	2.467	2.547	2.669	2.763	28
29	1.311	1.699	2.045	2.462	2.541	2.663	2.756	29
inf.	1.282	1.645	1.960	2.326	2.394	2.498	2.576	inf.

STATISTICAL TABLES

Values of χ^2_{α}

v	$\alpha = 0.995$	$\alpha = 0.99$	$\alpha = 0.975$	$\alpha = 0.95$	$\alpha = 0.05$	$\alpha = 0.025$	$\alpha = 0.01$	$\alpha = 0.005$	v
1	0.0000393	0.000157	0.000982	0.00393	3.841	5.024	6.635	7.879	1
2	0.0100	0.0201	0.0506	0.103	5.991	7.378	9.210	10.597	2
3	0.0717	0.115	0.216	0.352	7.815	9.348	11.345	12.838	3
4	0.207	0.297	0.484	0.711	9.488	11.143	13.277	14.860	4
5	0.412	0.554	0.831	1.145	11.070	12.832	15.086	16.750	5
6	0.676	0.872	1.237	1.635	12.592	14.449	16.812	18.548	6
7	0.989	1.239	1.690	2.167	14.067	16.013	18.475	20.278	7
8	1.344	1.646	2.180	2.733	15.507	17.535	20.090	21.955	8
9	1.735	2.088	2.700	3.325	16.919	19.023	21.666	23.589	9
10	2.156	2.558	3.247	3.940	18.307	20.483	23.209	25.188	10
11	2.603	3.053	3.816	4.575	19.675	21.920	24.725	26.757	11
12	3.074	3.571	4.404	5.226	21.026	23.337	26.217	28.300	12
13	3.565	4.107	5.009	5.892	22.362	24.736	27.688	29.819	13
14	4.075	4.660	5.629	6.571	23.685	26.119	29.141	31.319	14
15	4.601	5.229	6.262	7.261	24.996	27.488	30.578	32.801	15
16	5.142	5.812	6.908	7.962	26.296	28.845	32.000	34.267	16
17	5.697	6.408	7.564	8.672	27.587	30.191	33.409	35.718	17
18	6.265	7.015	8.231	9.390	28.869	31.526	34.805	37.156	18
19	6.844	7.633	8.907	10.117	30.144	32.852	36.191	38.582	19
20	7.434	8.260	9.591	10.851	31.410	34.170	37.566	39.997	20
21	8.034	8.897	10.283	11.591	32.671	35.479	38.932	41.401	21
22	8.643	9.542	10.982	12.338	33.924	36.781	40.289	42.796	22
23	9.260	10.196	11.689	13.091	35.172	38.076	41.638	44.181	23
24	9.886	10.856	12.401	13.848	36.415	39.364	42.980	45.558	24
25	10.520	11.524	13.120	14.611	37.652	40.646	44.314	46.928	25
26	11.160	12.198	13.844	15.379	38.885	41.923	45.642	48.290	26
27	11.808	12.879	14.573	16.151	40.113	43.194	46.963	49.645	27
28	12.461	13.565	15.308	16.928	41.337	44.461	48.278	50.993	28
29	13.121	14.256	16.047	17.708	42.557	45.722	49.588	52.336	29
30	13.787	14.953	16.791	18.493	43.773	46.979	50.892	53.672	30
40	20.706	22.164	24.433	26.509	55.758	59.342	63.691	66.766	40
50	27.991	29.707	32.357	34.764	67.505	71.420	76.154	79.490	50
60	35.535	37.485	40.482	43.118	79.082	83.298	88.379	91.952	60
70	43.275	45.442	48.758	51.739	90.531	95.023	100.425	104.215	70
80	51.172	53.540	57.153	60.391	101.879	106.629	112.329	116.321	80
90	59.196	61.754	65.646	69.126	113.145	118.136	124.116	128.299	90
100	67.328	70.065	74.222	77.929	124.342	129.561	135.807	140.169	100

* This table is based on Table 8 of *Biometrika Tables for Statisticians*, Vol. 1, by permission of the *Biometrika* trustees.