BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2019-2020

Sub : **NAME 217** (Theoretical Ship Design)

Full Marks : 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Assume reasonable values for missing data. Symbols have their own meanings.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) From viewpoint of ship economy, what are the principal parameters to be considered in any marine transport system? How loan, escalation and depreciation create complexities in ship economy, explain. **(20)**

   (b) What are the main objectives to be assessed for seakeeping and design consideration? What are the problems that may arise because of moderate or highly rough seas? **(15)**

2. (a) Which ship parameters are important from a seakeeping point of view? **(10)**

   (b) What is ship maneuvering? State the significance of ship maneuvering. **(15)**

   (c) What are the aspects to be considered basically in rudder design? **(10)**

3. (a) Explain why the ship resistance is important? Show in a graph, the basic components of ship hull resistance. **(15)**

   (b) A ship of 3500 t displacement has speed 15 kn, length 90 m. The towing tank model has 3 m length. At which speed should the model be tested? **(10)**

   (c) Sketch ship drive train system, hence, show the different components of powers from EHP to BHP. **(10)**

4. (a) For a new design, if was found that after towing a ship model that the power extrapolated to the full-size ship was 3475 kW. Using basic ship information it was decided to use the following information: hull efficiency 99.24%, propeller efficiency 68.75%, shaft losses 2.85%, diesel engine efficiency 88.73%, weather and appendage allowances 18.5%. **(15)**

   (i) Calculate all the powers from the propeller tips to the Engine Room.

   (ii) What is the power loss in kW between the thrust block to the propeller tail shaft?

   (b) Suppose that you are going to analyze structural strength of a container ship. In order to do that, draw a flow diagram of direct structural analyze which shows different components for the analysis. **(20)**

Contd P/2

NAME 217

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Define grain capacity, moulded capacity and bale capacity. For a basic ship and a new ship, the following particulars are known:

Item	Basic	New Design
LBP (m)	134.0	137.0
Breadth (m)	18.5	19.5
Depth (m)	12.0	12.2
Grain capacity (m^3)	17600	-
Tank top (m)	1.25	1.40
C_D	0.76	0.75
Deck shear forward (m)	2.52	3.20
Deck Shear aft (m)	1.20	1.46
Tank celling (m)	0.06	0.06
Non Cargo spaces (m^3)	3700	4490

Estimate the final grain and bale capacities for the new design. **(17)**

(b) The principal particulars of a container ship are given below:

Basic Ship		New Ship	
LOA	: 178.80 (m)	LOA	:188.80 m
LBP	: 169.4 (m)	LBP	:175.4 m
B_{mld}	:27.20 (m)	B_{mld}	:29.20 m
D_{mld}	:14.20 (m)	Depth	:15.20 m (moulded)
Design draft	:10.20 (m)	Design draft	:10.5 (m)
Light ship (steel)	:10638 tones	Light ship (steel)	
C_B	:0.75	C_B	:0.765
Forward shear	:3680 (mm)	Forward shear	:3648 mm
Aft shear	:1740 (mm)	Aft shear	:1824 mm

Find: **(18)**

(i) Steel weight of new ship using Cubic Number Method.

(ii) Steel weight of new ship using method of differences considering C_B corrections, Scantling corrections and deck shear corrections.

6. (a) What do you mean by feasibility study? Why feasibility study is necessary? What are the types of feasibility study to be carried out in ship design project? **(17)**

(b) Explain the basic, contract and detailed design of marine structure with the help of design spiral. **(18)**

7. (a) Explain the importance of lines plan drawing in shipbuilding. Point out the considerations of arrangement drawings of ship. **(17)**

(b) What is deadweight to displacement ratio (DWR) of a ship? Explain the factors to be considered for variation of DWR. **(18)**

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8. (a) A type B inland ship has a freeboard length of 102 m measured on a waterline at 85% of the moulded depth of 9.5 m and a beam of 15.5 m. There is no bridge amidship, the forecastle and poop have mean covered length of 18 m and 9 m and height of 2.6 m respectively. Thickness of deck plating is 12 mm and block co-efficient at 85% depth is 0.69. The formula for calculating the standard freeboard of type, B ship $f = .587 + 23\ L - 0.088\ L^2$ mm where L is in m. The shear of the freeboard deck in mm is as follows:

AP	L/6	L/3	L/2	2L/3	SL/6	FP
570	255	65	0	225	900	1875

Find the summer free board considering length block co-efficient and depth corrections. **(25)**

(b) A general cargo ship is 134 m length × 18.12 m breadth moulded. She has a final wood and outfit (W & O) weight of 700 tonned. A new ship has the preliminary dimensions of 137.5 m length and a breadth moulded of 18.5 m. Estimate the W & O weight for the new design based on Co-efficient and proportional procedures. **(10)**

Freeboard Regulations:

[For Question No. 7(a)]

Regulation 29: *Correction to the Freeboard for Ships under100 m in length*

The tabular freeboard for a Type `B' ship of between 24 m and 100 m in length having enclosed superstructures with an effective length of up to 35 per cent of the length of the ship shall be increased by:

$$7.5(100 - L)\left(0.35 - \frac{E}{L}\right) mm$$

where L = length of ship in metres,
where E = effective length of superstructure in metres defined in Regulations 35.

Regulation 30 *- Correction for Block Coefficient (C_b)*

Where the block coefficient (C_b) exceeds 0.68, the tabular freeboard specified in Regulation 28 as modified, if applicable, by Regulations 27(8), 27(10) and Regulation 29 shall be multiplied by the factor (C_b + 0.68) /1.36

Regulation 31 *Correction for Depth*

- *(1). Where D exceeds L/15 the freeboard shall be increased by*

  (D - L/15) x R millimeters, where R is L/0.48 at lengths less than 120 meters and 250 at120 meters length and above, or

- *(2). Where D is less than L/15 no reduction shall be made except in a ship with an enclosed superstructure covering at least 0.6 L amidships, with a complete trunk, or combination of detached enclosed superstructures and trunks which extend all fore and aft, where the freeboard shall be reduced at the rate prescribed in paragraph (1) of this Regulation.*

- *(3). Where the height of superstructure or trunk is less than the standard height, the reduction shall be in the ratio of the actual to the standard height as defined in Regulation 33.*

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L-2/T-2/NAME **Date : 07/04/2022**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2019-2020

Sub : **NAME 223** (Marine Hydrodynamics)

Full Marks : 210 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Symbols have their usual meaning.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Assume reasonable values for missing data.

1. (a) Mention Blassius's theorem for determining the resultant force and moment exerted by a fluid in steady two-dimensional flow past a cylinder of any cross-sectional form. Hence prove the theorem. **(20)**

   (b) Following Blassius's theorem for two-dimensional flow past a profile of any cross section, with circulation, show that the drag force is zero and the lift force is $-\rho UI$. **(15)**

2. (a) Derive the equation of the velocity profile for parallel viscous flow between two fixed parallel plates. **(18)**

   (b) What do you mean by boundary layer separation? Water at 70°F flows past a smooth plane surface. Near a point on the surface several feet from the leading edge the velocities at ¼ inch and ½ inch from the wall are 6.0 and 6.5 ft/sec, respectively. Assuming that the boundary layer is turbulent, determine y′, v* and δ′ and estimate the velocity one inch from the wall. Given $\nu = 1.06 \times 10^{-5}$ ft^2./sec. **(17)**

3. (a) Write short notes on- **(8)**

   (i) boundary layer thickness

   (ii) displacement thickness

   (b) Distinguish between laminar, transition and turbulent boundary layer. With figure demonstrate velocity distributions in flow past a flat plate having mentioned three boundary layers. How Reynold's number value can be used to define the different boundary layers? **(15)**

   (c) Schematically explain the transformation of flow past a streamlined strut. **(12)**

4. (a) If $w = f(z)$, where $w = \Phi + i\psi$ and $z = x + iy$, find the values of Φ and ψ for the following functions of z and with neat sketch identify the flow patterns in the z-plane. **(15)**

   (i) $w = m \ln (z - a)$

   (ii) $w = \dfrac{\mu}{z - a}$

   (b) Explain analytic function with example. **(5)**

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NAME 223
Cont... Q. No. 4

(c) Discuss the significance of $\frac{dw}{dz}$ as a complex operator. For complex velocity, prove that $\frac{dw}{dz} = |V|.e^{-i\alpha}$; where the symbols have their usual meaning. **(15)**

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Show that the two-dimensional irrotational flow stream function $\psi = U\left(r - \frac{a^2}{r}\right)\sin\theta$ represents the pattern of steady flow in the x-direction, past a cylinder of radius a of an infinite fluid whose undisturbed velocity is U. Determine the potential function and find the distribution of velocity in nondimensional form along the x-axis and y-axis, on the boundary of the cylinder. **(18)**

Additionally, if the pressure in the undisturbed flow is p_0, determine the pressure distribution around the cylinder, the location of the stagnation points and the stagnation pressure.

(b) Develop the equation for total kinetic energy in Irrotational flow. What conclusions can you draw from the kinetic energy considerations? **(17)**

6. (a) Develop Navier-Stockes Equations for a Newtonian Fluid. **(20)**

(b) "The existence of a velocity potential implies that flow is irrotational", Explain. **(15)**

7. (a) A long circular cylinder lies in an air stream having a velocity of 60.96 m/s. In addition, there is a flow around the cylinder with a circulation of -404.13 m^2/s. Neglecting all viscous and compressibility effects, determine: **(18)**

   (i) the maximum velocity due to the air stream alone,
   (ii) the velocity at the cylinder surface due to the circulation alone,
   (iii) the maximum velocity,
   (iv) the location of the stagnation points,
   (v) the maximum and minimum pressures,
   (vi) the lift force per foot length of cylinder.

The density of the air is 1.22 kg/m^3. The cylinder diameter is 1.22 m.

(b) Establish the equation for the kinetic energy in a fluid due to a moving cylinder. Also, verify the equation by the application of the energy equation. **(10)**

(c) An empty steel cylinder is 2 ft. in external diameter and its wall is $\frac{1}{2}$ in. thick. Find the ratio of the force per ft. length required to accelerate the cylinder normal to its axis in a non-viscous fluid with the density of sea water, to that required for the same acceleration in air. **(7)**

Contd P/3

NAME 223

8. (a) Show that the pattern of an Irrotational vortex resembles that of a source with the ϕ-line and ψ-line interchanged. Also, discuss the variation between the irrotational vortex of an ideal fluid and that of a real fluid. **(18)**

   (b) "The circulation about any curve enclosing the axis and no other singular point is constant and equals the vortex strength; and that the circulation around any closed curve which does not enclose the axis, or any other singular point must be zero" – Justify this statement. **(17)**

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L-2/T-2/NAME **Date: 31/03/2022**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2019-2020

Sub: **HUM 211** (Sociology)

Full Marks: 140 Time: 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** from the rest.

1. (a) What is social stratification? Explain the features of the caste system and class system of social stratification. **(10)**

   (b) What do you understand by social mobility? Discuss horizontal mobility and vertical mobility with examples. **(13 ⅓)**

2. (a) Explain the characteristics of nuclear family and joint family. **(10)**

   (b) How does the functionalist perspective explain the various contributions of family in our society? **(13 ⅓)**

3. (a) What is deviance? Explain the interrelationships between deviance and social stigma. **(10)**

   (b) Briefly discuss the social perceptions of white-collar crime and technology-based criminal activities. **(13 ⅓)**

4. Write short notes on any three of the following: **(23 ⅓)**

   (a) Sociological imagination.

   (b) Functionalist perspective.

   (c) Social norms and social values.

   (d) Sub-culture and counter culture.

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What do you mean by natural greenhouse and man-made green house? **(10)**

   (b) What is meant by environment and pollution? How can we save the environment and make it greener? **(13 ⅓)**

Contd P/2

HUM 211

6. (a) What do you know about optimum population theory? Provide a brief criticism to your answer. **(10)**

   (b) How do you define demography, crude birth-rate and crude death-rate? Describe the stages of demographic transition theory. **(13 ⅓)**

7. (a) What is globalization? Discuss the cultural and economic impacts of globalization on our society. **(10)**

   (b) Illustrate the positive and negative impacts of capitalism on a society. **(13 ⅓)**

8. Write short notes on any THREE of the following- **(23 ⅓)**

   (a) Sources of social change

   (b) Consequences of Industrial Revolution

   (c) Potential consequences of global warming

   (d) Evolution of city life

L-2/T-2/NAME **Date: 27/03/2022**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2019-2020

Sub: **MATH 283** (Partial Differential Equations, Matrices and Statistics)

Full Marks: 210 Time: 3 Hours

The figures in the margin indicate full marks

Symbols used have their usual meaning

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE** questions.

1. (a) Form a partial differential equation by eliminating the function f from **(11)**

$$z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$$

(b) Find the general solution of the partial differential equation **(12)**

$$\cos(x+y)p + \sin(x+y)q = z$$

(c) Find the complete and singular integral (if it exists) by using Charpit's method: **(12)**

$$(p^2 + q^2)y = qz$$

2. Solve the following PDEs:

(a) $\left(D_x^2 + D_x D_y - 6D_y^2\right)z = y\sin x$. **(11)**

(b) $\left(D_x^2 - D_y^2 + D_x + 3D_y - 2\right)z = e^{x-y}$. **(10)**

(c) $\left(x^2 D_x^2 + 2xyD_x D_y + y^2 D_y^2\right)z = \left(x^2 + y^2\right)^{\frac{n}{2}}$. **(14)**

3. (a) Determine a, b, c when the matrix given below **(11)**

$$\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$$ is orthogonal.

(b) Test the consistency and hence solve the following system of equations: **(12)**

$$\begin{aligned} 4x - 3y - z &= 3 \\ 3x + y - 2z &= 1 \\ x + 2y + z &= 2 \\ 2x - y - 3z &= -1 \end{aligned}$$

(c) Use elementary row operations to find the inverse of **(12)**

$$A = \begin{bmatrix} 1 & 2 & -1 \\ -4 & -7 & 4 \\ -4 & -9 & 5 \end{bmatrix}.$$

Contd P/2

MATH 283

4. (a) Find non-singular matrices P, Q so that PAQ is in normal form where **(17)**

$$A=\begin{bmatrix}2 & 1 & -3 & -6\\ 3 & -3 & 1 & 2\\ 1 & 1 & 1 & 2\end{bmatrix}.$$

(b) Reduce A to the diagonal matrix by congruent transformation and interpret the result in terms of quadratic forms where **(18)**

$$A=\begin{bmatrix}1 & 2 & -1\\ 2 & 1 & 3\\ -1 & 3 & 1\end{bmatrix}.$$

Also write down the corresponding linear transformation.

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE** questions.

5. (a) Find all eigenvalues and corresponding eigenvectors of the following matrix **(18)**

$$\begin{pmatrix}1 & -3 & 3\\ 3 & -5 & 3\\ 6 & -6 & 4\end{pmatrix}$$

(b) State and verify Cayley-Hamilton theorem for the matrix A and using this theorem, find A^{-1}, where **(17)**

$$A=\begin{pmatrix}1 & 0 & 4\\ 0 & 5 & 4\\ 4 & 4 & 3\end{pmatrix}$$

6. (a) An analysis of workers resulted in the following distribution: **(15)**

Earnings (Tk)	50-70	70-90	90-110	110-130	130-150	150-170	170-190
No. of Employees	4	8	12	20	6	7	3

Calculate the first four moments about assumed mean. Convert the result into moments about the mean.

(b) From the data given below calculate Karl Pearson's coefficient of skewness and Kurtosis and interpret them. **(20)**

Overtime (hr)	10-15	15-20	20-25	25-30	30-35	35-40
No. of workers	11	20	35	20	8	6

Contd P/3

MATH 283

7. (a) To study the tensile strength of a certain type of wire, the following pairs of observations were recorded, where x is the diameter in cm and y is the mass supported in kg/cm. **(15)**

x	0.6	0.8	1.0	1.2	1.4	1.6
y	14	26	50	56	42	98

(i) Fit a linear regression model Y on X.

(ii) Is the linear model appropriate for given data, justify your result using coefficient of determination?

(b) A fast-food restaurant operates both a drive through facility and a walk-in facility. On a randomly selected day, let X and Y, respectively, be the proportions of the time that the drive-through and walk-in facilities are in use, and suppose that the joint density function of these random variables is **(10)**

$$f(x,y)=\begin{cases}\frac{2}{3}(x+2y), & 0\le x\le 1, \quad 0\le y\le 1\\ 0, & \textit{elsewhere.}\end{cases}$$

(i) Find the marginal density of X.

(ii) Find the marginal density of Y.

(iii) Find the probability that the drive-through facility is busy less than one-half of the time.

(c) Each sample of water has a 15% change of containing a particular organic pollutant. Assume that the samples are independent with regard to the presence of the pollutant. **(10)**

(i) Find the probability that in the next 18 samples, exactly 3 contain the pollutant.

(ii) Determine the probability that at least four samples contain the pollutant.

(iii) If x is the number of samples that contain the pollutant, then determine the probability that $3 \le x < 7$.

8. (a) Imperfections in computer circuit boards and computer chips lend themselves to statistical treatment. For a particular type of board, the probability of a diode failure is 0.03 and the board contains 200 diodes. **(10)**

(i) What is the mean number of failures among the diodes?

(ii) What is the variance?

(iii) The board will work if there are no defective diodes. What is the probability that a board will work?

Contd P/4

MATH 283

Contd... Q. No. 8

(b) A soft-drink machine is regulated so that it discharges an average of 200 milliliters per cup. If the amount of drink is normally distributed with a standard deviation equal to 15 milliliters, **(15)**

(i) What fraction of the cups will contain more than 224 milliliters?

(ii) What is the probability that a cup contains between 191 and 209 milliliters?

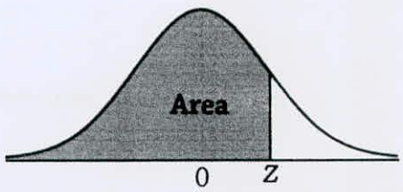
(iii) How many cups will probably overflow if 230 milliliter cups are used for the next 1000 drinks?

(iv) What value do we get for the smallest 25% of the drinks?

(Necessary Table 1 and 2 are attached)

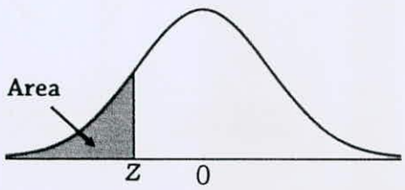
(c) Air crew escape systems are powered by a solid propellant. The burning rate of this propellant is an important product characteristic. Specifications require that the mean burning rate must be 50 centimeters per second. It is known from the research that the standard deviation of burning rate is 2 centimeters per second. The experimenter decides to specify a type I error probability at significance level of 0.05 and selects a random sample of 25 and obtains a sample average burning rate of 51.3 centimeters per second. What conclusions should be drawn? **(10)**

(Necessary Table 3 is attached)



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Table 1: Necessary Table for Question No. 7(b)

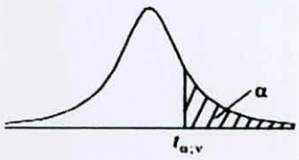


z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Table 2: Necessary Table for Question No. 7(b)

Table of the Student's *t*-distribution

The table gives the values of $t_{\alpha;\nu}$ where
$\Pr(T_\nu > t_{\alpha,\nu}) = \alpha$, with ν degrees of freedom



ν \ α	0.1	0.05	0.025	0.01	0.005	0.001	0.0005
1	3.078	6.314	12.076	31.821	63.657	318.310	636.620
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Table 3: Necessary Table for Question No. 8(b)