BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations (January 2020 Term)

Subject: **CSE 205** (Digital Logic Design)

Full Marks: 180 Section Marks: 90 Time: 2 Hours (Sections A + B)

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – B

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

5. (a) Prove the following Boolean algebra formula: $(x+y)(\bar{x}+z)(y+z) = (x+y)(\bar{x}+z)$. **(10)**

   (b) Convert the Boolean function $xy + z$ into the canonical form with respect to maxterms. **(12)**

   (c) Prove that the NOR operation does not follow the associative law. **(8)**

6. (a) Using K maps (Karnaugh maps), find the simplified *sum of products form* of the following Boolean function: $f(w,x,y,z) = \sum(1,5,8,12,14,15)$, where the don't care minterms are 3 and 11. **(12)**

   (b) Prove that the NAND gate is a universal gate. **(8)**

   (c) Implement the following Boolean function with *only* NAND gates: $f(x,y,z) = \prod(3,7)$. **(10)**

7. Using basic gates, you need to design a comparator circuit which takes two *2 bit numbers, A and B* as inputs and tells whether A<B, A=B or A>B. Show the truth table and derive the simplified expressions for the outputs of your designed circuit. **(10+20=30)**

8. (a) Show how you will subtract 69 from 12 (*i.e.* compute 12 - 69) in two's complement form. Assume 8 bits are used for each number. **(12)**

   (b) Explain the rippling effect in Binary Adders. **(8)**

   (c) Consider a 3×8 decoder whose outputs are active low and which has one active high enable signal. Implement the following function with the above mentioned decoder: **(10)**

   $$f(x,y,z) = \prod(1,3,7)$$

   Note that you are allowed to use only one decoder and other basic gates to implement the function.

L-2/T-1/CSE **Date: 18.01.2021**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-1 B. Sc. Engineering Examinations 2018-2019

Sub: **MATH 245** (Complex Variables and Statistics)

Full Marks: 180 Time: 2 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Symbols used have their usual meaning.

SECTION-A

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

1. (a) Prove that if the amplitude of a complex number z is $\frac{\pi}{2}$ then the complex number is purely imaginary. Also show that $f'(z)$ exist at $z = i$ if $f(z) = x^3 + i(1-y)^3$. (20)

   (b) Transform the circle $x^2 + y^2 - 4x = 0$ into a straight line applying the transformation $w = \frac{2z+3}{z-4}$. (10)

2. (a) Find all roots of the equation $\sin z = \cosh 4$ by equating the real and imaginary parts of $\sin z$ and $\cosh 4$. (15)

   (b) Show that $u = 2x(1-y)$is a harmonic function. Find an analytic function $f(z) = u(x,y) + iv(x,y)$ and express $f(z)$ in terms of z. (15)

3. (a) Using Cauchy's integral formula, evaluate the the integral, (15)

   $\oint_C \frac{e^{3z}}{z-\pi i} dz$, where C is the curve $|z-1| = 4$.

   (b) Express $f(z) = \dfrac{z-1}{(z+2)(z+3)}$ in a Laurent series valid in the region $2 < |z| < 3$. (15)

4. (a) Let C be the arc of the circle $|z| = 2$ from $z = 2$ to $z = 2i$, that lie in the first quadrant, then show that $\left|\int_C \frac{dz}{z^2-1}\right| \leq \frac{\pi}{3}$. (10)

   (b) Evaluate the integral, $\int_0^{2\pi} \frac{\sin 2\theta}{5-3\cos\theta} d\theta$ using the method of contour integration. (20)

SECTION-B

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

5. (a) Why is central tendency important? Where can we use central tendency in our daily life? (5)

   (b) Over a period of 30 days the percentage relative humidity in a vegetable storage building was measured. Mean daily values were recorded as shown below: (25)

60	63	64	71	67	73	79	80	83	81
86	90	96	98	98	99	89	80	77	78
71	79	74	84	85	82	90	78	79	79

   Summarize the data into a frequency distribution table and hence calculate mean, median and mode.

6. (a) An analysis of electricity consumption resulted in the following distribution: (15)

Consumption (kw/h)	0-10	10-20	20-30	30-40	40-50
No. of users	6	25	36	20	13

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

   (b) Calculate skewness and kurtosis for the data given in 6(a), hence comment on the calculated values of skewness and kurtosis. (15)

7. (a) What is a random variable? How can you generate a random variable from an experiment of tossing a coin three times? How do you distinguish a discrete random variable from a continuous one? Give examples. (12)

(b) A company has the following data on its sales during the last year in each of its regions and the corresponding number of salespersons employed during this time: (18)

Region	Sales (units)	Salespersons
A	236	11
B	234	12
C	298	18
D	250	15
E	246	13
F	202	10

Develop a linear model for forecasting sales from the number of salespersons.

8. (a) It is known that 4% of the TABs produced by MMR Co. are defective. Find the probability (using both Binomial and Poisson distributions) that a box of 300 of these TABs contains at most 5 defective TABs. (15)

(b) Define Type-I and Type-II errors, One-tailed and two-tailed tests. A manufacturer intends that his electric bulbs have a life of 1000 hours. He tests a sample of 20 bulbs, drawn at random from a batch and discovers that the mean life of the sample bulbs is 990 hours with standard deviation of 22 hours. Does this signify that the batch is not up to the standard? (Given that $\nu = 19$, $t_{0.01} = 2.539$). (15)