International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Assessment of Autumn-2020	**Program: B.Sc. Engg. (EEE)**
Course Code: **EEE-3519**	Course Title: **Power System Analysis**
Time: **5 hours** (Writing - **4 hours 30 minutes** + **30 minutes** submission time)	Full Marks: **50** (**Written** 30 + **Viva/Viva-Quiz**-20)

[Answer **each of the** questions from the followings; Figures in the right margin indicate full marks. **Answer script must be submitted through online method within 5 hours from starting time. Also, write down the Q. Set on the front page of your answer script]**

Question SET Selection Process:

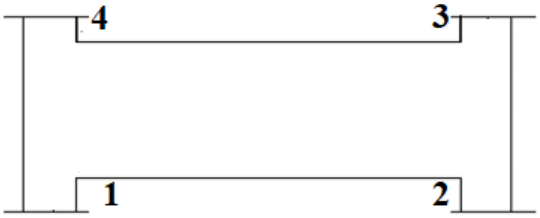
****Please show the ***Calculation of Question SET Selection*** at the 1st page of answer sheet. ***

***LDI**=x=Last digit of student ID*

[For Question ***SET*** Selection: *(Last digit of Student ID=x)+(the Digit before last digit of Student ID=y)=**Z** .* If **Z** is ***even*** your Question **SET-A** and If **Z** is ***odd*** your Question **SET-B** *If the value of* **Z=0**, *answer* ***Question SET-B***.

Example: for St. ID =ET 151015; St. last digit of ID=1=***x***; and the digit before last digit of ID is =5=**y**; So, **Z**=*(x+y)*=(1+5)=**6**. Here, 6 is an ***even*** number. So you have to Answer ***Question SET*-A**.]

SET-B

SL.	Question	Course Outcome	Bloom's Level	Marks
Q.1.	 Fig. 1. Typical power system The line admittance of typical bus system given bellow:			

Line (bus to bus)	Admittance (pu)
1-2	-j3
2-3	-j4
1-4	-j5
4-3	-j6

Bus data

Bus	P_p *pu*	Q_p *pu*	V_p *pu*	*Remarks*
1	0.3	−0.1	–	PQ bus
2	–	–	1.04 ∠0°	Slack bus
3	−1.0	0.5	–	PQ bus
4	0.5	−0.2	–	PQ bus

1(a).	A 4-bus power system shown in the Fig. 1. The relevant p.u line admittances on 50 MVA base are indicated on the diagram and bus data are given in the table. Form Ybus and determine V1, V3 and V4 after second iteration using Gauss-Seidal Method. Use α = 1.6.	**CO2**	**Ap**	**06**

2(a).	kVA rating does not change the short circuit current if there is any unsymmetrical fault occurred in transmission line –**Justify with example**.	**CO3**	**An**	**03**
2(b).	One conductor of a 3-phase line is open. The current flowing to the Δ-connected load through the line "**a**" is ***I*** A. With the current in line "**a**" as **reference** and assuming that line "**b**" is open, **find** the symmetrical components of the line currents. **Draw** the circuit arrangement at first. *Here, the value of **'I'** is **10 times** of the summation of **last two digits** of your **roll** number.*	**CO3**	**E**	**03**
3(a).	"The symmetrical components do not have separate existence"-**Justify** the statement with suitable illustration	**CO3**	**Ap**	**02**
3(b).	A synchronous generator and motor rated 100 MVA, 11 kV and both have subtransient reactances of 0.25. The line connecting them has a reactance of 0.15 on the base of the machine ratings. The motor is drawing '***P***' MW at 0.75 p.f. leading and a terminal voltage of 9.5 kV when a Symmetrical 3-φ fault occurs at motor terminals. **Find** the subtransient current in the generator, motor and fault by using internal voltage of machines. *Here, the value of **'P'** is **10 times** of the summation of **last two digits** of your **roll** number.*	**CO3**	**E**	**04**
4(a).	Construct the sequence network and deduce the expression of current if **Line-to-Line-Ground (L-L-G)** fault occurs between two phase of a star connected Synchronous Machine.	**CO3**	**E**	**02**
4(b).	A salient pole generator without dampers is rated 50MVA, 12.6kV and has a direct axis subtransient reactance of **0.*X*** p.u. The negative and zero sequence reactance are 0.20 and 0.15 p.u. respectively. The neutral of the generator is solidly grounded. **Determine** the subtransient current and **Line-to-Line-Ground (L-L-G)** voltages when line-to-line fault occurs at the terminals of the generator. Assume that the generator is unloaded and operating at rated terminal voltage when the fault occurs. Neglect the resistance. *Here, the value of **'X'** is **10 times** of the summation of **last two digits** of your **roll** number.*	**CO3**	**Ap**	**04**
5(a).	**How** power swing equation clarifies the stability of a single or two synchronous machine. **Illustrate** with related equations and diagram.	**CO1**	**An**	**03**
5(b).	A generator is delivering 70% of maximum power to an infinite bus through a transmission line at supply **frequency** is 60Hz. A fault occurs such that the reactance between generator and infinite bus is increased to three times its pre fault value. When the fault is cleared, the maximum power that can be delivered is 85% of its original value. Determine the critical clearing angle (δ_{cr}) and critical clearing time (t_{cr}). *Here, the value of **'H'** is the summation of **last two digits** of your **roll** number.*	**CO1**	**E**	**03**
6.	Viva/Viva-Quiz: The time of viva/viva-quiz will be declared in google classroom and other online platform.	**CO2**	**R,U,An**	**20**