

Course No: ECE 3107
Full Marks: 72

Course Title: **Electrical Machine -II**
Time: 3 Hours

- N.B. (i) Answer any **SIX** questions taking **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) The questions are of equal value
(iv) Use separate answer script for each section

Section - A

- Q1 (a) What are the essential parts of a dc machine? 04
(b) Classify the dc machines. Also draw their electrical equivalent circuits. 04
(c) Why the armature core but not the magnetic pole core in a dc machine is constructed with laminated steel sheets instead of solid metal blocks? 02
(d) What are cumulative and differentially compound dc machines? 02
- Q2 (a) Describe the voltage build up process of a self excited shunt generator. 04
(b) List the causes for the failure of a dc generator to self excite. 04
(c) A train is driven by a dc generator with separately excited field. The OCC of the machine at 1500 rpm has been measured as follows: 04
- E_A (volts): 50 420 780 950 1120 1180 1260
 I_f (A) : 0 4.0 8.0 10.0 12.8 14.4 28.8
- (i) Draw the OCC of the machine and determine the value of critical resistance.
(ii) Why is a voltage in the armature at zero field current?
(iii) Why does the induced voltage at high field currents not increase proportional to field current?
(iv) What should be the field resistance for an armature induced voltage of 1000 volts?
- Q3 (a) What are base speed and back emf of a dc motor? 02
(b) Explain the effect of change in shaft load on a dc shunt motor. 03
(c) Why is it recommended to never unload a dc series motor while running? 03
(d) Explain two basic speed control scheme of dc shunt motor. 04
- Q4 (a) What is armature reaction? Describe the effect of brush shifting. 04
(b) What are the conditions of parallel operation of dc generators? 04
(c) Two shunt wound generators running in parallel each have armature resistance of 0.03Ω and field resistance of 60Ω . The combined external load is 4500A. The field of the generators are so excited that the induced voltage of one machine is 500v & another is 510v. Calculate, 04
(i) bus bar voltage
(ii) generated power

Section - B

- Q5 (a) State various advantages of stationary armature in an alternator. Also differentiate between salient and non-salient pole synchronous machines. 03
(b) What is a fractional pitch winding and why is it used in synchronous machines? 02
(c) Define pitch factor and distribute factor. Also derive their equations. 04
(d) What is torque angle? Derive the equation of output power of a synchronous generator in terms of the torque angle of the machine. 03

- Q6 (a) Explain the loading effect on the generated voltage of the alternator operating at lagging pf, with necessary diagrams. 05
- (b) A 3- ϕ synchronous generator is driven by a gas turbine. The synchronous reactance/phase is 4Ω and the armature resistance is zero. It has first been connected to an infinite bus with a phase voltage of 20 kv and a frequency of 50 Hz in a proper way. 07
- What do you mean by infinite bus?
 - What are the conditions that have to be satisfied before a synchronous machine can be connected to the bus?
 - What is the induced voltage just at the time of connecting the machine with the bus?
 - If the field current is doubled while the power remains the same as in (iii) determine the armature current.
 - If the power is increased to 300 MW while the field current remains the same as in (iv), calculate the torque/load angle.
- Q7 (a) Explain the principle of operation of 3 ϕ synchronous motor in brief. $3\frac{1}{2}$
- (b) What is synchronizing? Describe one method of synchronizing. $3\frac{1}{2}$
- (c) With a constant load on a synchronous motor, what are the effects produced by increasing the dc field current? 04
- (d) What do you mean by V-curve of a synchronous motor? 01
- Q8 (a) What is servo motor? Write its applications. 04
- (b) Explain the operation of a stepper motor. 03
- (c) "The speed regulation of a synchronous motor is 0% over its operating range".- Explain. 03
- (d) What is synchronous condenser and why is it used? 02

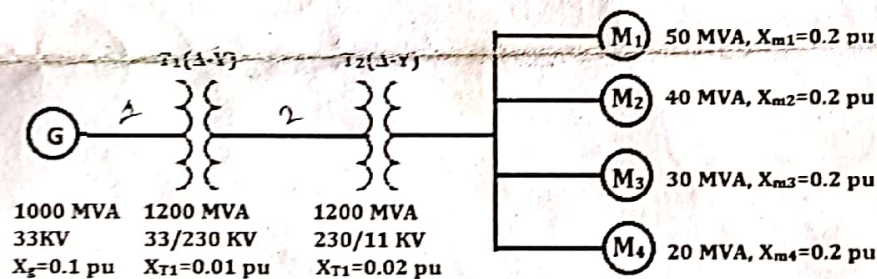
Course No: ECE 3109
Full Marks: 72

Course Title: Power System
Time: 3 Hours

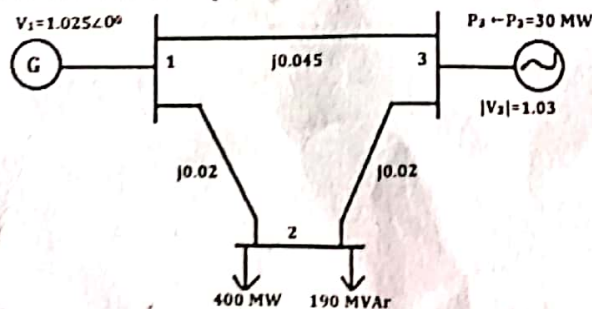
- N.B. (i) Answer any **SIX** questions taking **THREE** from each section.
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(iii) The questions are of equal value
(iv) Use separate answer script for each section

Section - A

- Q1 (a) Define (i) short (ii) medium and (iii) long transmission power lines. 03
(b) Evaluate the generalized circuit constants for medium line using nominal π method. 05
(c) Explain the layout of single line diagram of power system. 04
- Q2 (a) What do you mean by (i) reactance and (ii) capacitance in power line? 03
(b) Draw the load line and reactance diagram of power system. 03
(c) Briefly describe the following methods for analysis of the load flow problem in power system. 06
(i) Gauss-Seidel Method and (ii) Newton-Raphson method.
- Q3 (a) Draw the per unit equivalent circuit of a single phase transformer with necessary equations. 03
(b) The power system network is given below. Find the per unit equivalent circuit and total impedance. 06

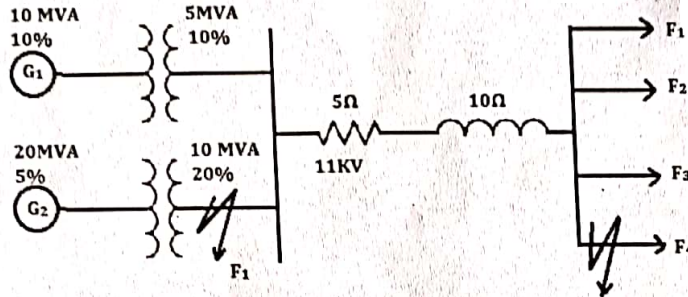


- (c) Calculate the capacitance to neutral per km with and without considering the effect of earth. Radius of the conductor is 0.01m, spaced 3.5m apart and 8m above the ground. Also compare the result. 03
- Q4 (a) Why load flow study is important in power system engineering? 01
(b) The following figure shows single line diagram of a 3-bus system. BUS 3 is a p|v| bus. 11
(i) Using G-S method and initial assumed voltage $v_2^0 = 1\angle 0$ and $v_3^0 = 1.03\angle 0$, Determine V_2 and V_3 .
(ii) Calculate line flows and line losses.
(iii) Calculate slack bus power.



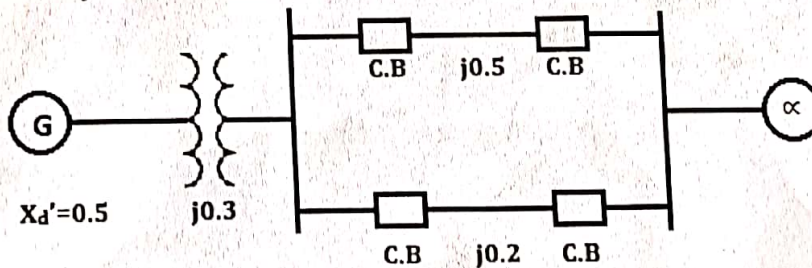
Section B

- Q5 (a) Write the name of possible all methods to control the voltage. Describe tap changing method. 03
- (b) Determine the transformer tap ratios when the receiving end voltage is equal to the sending end voltage. The high voltage line operates at 230 kv and transmit 500 MW at 0.9 pf and the impedance of the line is $(40 + j140)\Omega$, Assume $t_{sR} = 1.0$ 06
- (c) What is SVC? Describe its function. 03
- Q6 (a) What is the difference between symmetrical and unsymmetrical fault current. 03
- Prove that short circuit KVA = Base KVA $\times \frac{\text{short circuit KVA}}{\text{Base KVA}} \times \frac{100}{\%X}$ 07
- (b) A 3 phase transmission line is shown below:

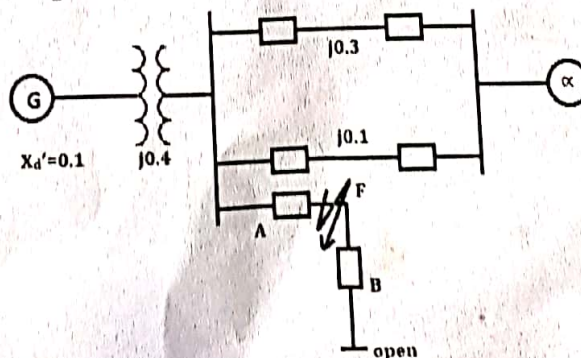


Calculate the fault current and the short circuit KVA in two faulted point.

- (c) What is % of impedance and what is the importance of reactor in power system? 02
- Q7 (a) What do you mean by sequence components? Prove that positive sequence current, $I_1 = \frac{1}{3}(I_R + aI_Y + a^2I_B)$ where the symbols have their usual meaning. 03
- (b) There impedances of $5-j10$, $6+j5$ and $3+j15$ ohms are connected in star to red, yellow and blue lines of a 3-phase, 3 wire supply. The phase sequence is RYB. Calculate the line current I_R . 06
- (c) Draw the complete power system network with necessary indicators. 03
- Q8 (a) Classify power system stability at a glance. 02
- (b) The power system network is given below: 06



- (i) Determine the swing equation
- (ii) Determine the power-angle equation for the system applicable to the operating conditions and also plot.
- (c) Define critical clearing time, t_{cr} and critical clearing angle for the following network considering $H = 10\text{MJ/MVA}$. 04



Heaven's Light is Our Guide
Rajshahi University of Engineering & Technology
B.Sc. Engineering 3rd Year Odd Semester Examination, 2018
Department of Electrical & Computer Engineering

Course No: **ECE 3111**
Full Marks: **72**

Course Title: **Microprocessors & Assembly Language**
Time: **3 Hours**

- N.B.** (i) Answer any **SIX** questions taking **THREE** from each section.
(ii) Figures in the margin Indicate full marks.
(iii) The questions are of equal value
(iv) Use separate answer script for each section

Section - A

- Q1 (a) What is the importance of microprocessor in microprocessor-based computer system? How does a microprocessor differ with a microcontroller? 04
(b) Draw and discuss the organization of 8088 microprocessor system design. 04
(c) Write down the specific use of general purpose registers and control flags. 04
- Q2 (a) Explain why the system with multi-core processor is better than the system with single core processor? 2½
(b) How many cores are available in the following processor family? 1½
(i) Core i3 (ii) Core i5 (iii) Core i7
(c) Draw and describe the system block diagram of Microprocessor system design. 06
(d) Find the unknowns value for each of the following physical addresses. Assume all numbers are hexadecimal numbers. 02
(i) 6765 : ? = DABC0
(ii) ? : CD21 = 32D21
- Q3 (a) What are the differences between CISC and RISC? Write down the instruction codes both for RISC and CISC processor of the statement $a[i] = a[i] + b[i]$: 04
(b) What are the advantages of pipelining in the process of instruction execution by a microprocessor? Discuss briefly the pipelining process. 04
(c) Discuss about the components of a microprocessor with necessary diagram. 04
- Q4 (a) How can the overhead to access memory by processor be reduced? Discuss briefly about such kind device and its process with necessary diagram if exist. 05
(b) Suppose AL contains 11001010b. Give the new contents of AL and CF after each of the following instruction is executed. 03
(i) ROL AL, CL where CL contains 2
(ii) ROR AL, CL where CL contains 2
(c) Which components of a microprocessor need to be redesigned to speed up the processing speed? Write your opinion. 02
(d) As larger size RAM is better for good performance but still why we can't install any larger size RAM as we want? Answer briefly. 02

Section B

- Q5 (a) Distinguish between memory mapped I/O and Isolated I/O. 02
(b) What is the mode and I/O configuration A, B and C of an 8255 PPI chip after it's control register loaded with 82H. 04
(c) Write an assembly code to calculate the factorial of a given number. 04
(d) Why DMA mode is faster than the instruction mode? 02
- Q6 (a) Write down a sequence of instructions to perform following problem. 04
Put the sum $100 + 95 + 90 + \dots + 5$ in AX.
(b) Write assembly code for each of the following decision structure. 06
(i) IF AL < 0
THEN
Put FFh in AH
ELSE
Put 0 in AH
END_IF

Assembly

- (ii) IF (AX<BX) OR (BX<CX)
THEN
Put 0 in DX
ELSE
Put 1 in DX
END_IF
- (c) Suppose DX register contains a number which may be positive or negative. Now write down the ways to reverse the sign of the number only. 02
- Q7 (a) What is the basic difference between AND and TEST instructions? 02
- (b) Write down an assembly program which will take a single digit as input and will calculate the sum of all one bits of its ASCII value. 04
- (c) Write a procedure to take a string up to new line and another procedure to reversely display the string using stack. The two procedures will then be called by main procedure. 04
- (d) What are the restrictions on MOV and XCHG instructions in assembly language? 02
- Q8 (a) Discuss what happens when the PC is powered up. 03
- (b) Briefly describe how an assembly instruction is executed? 03
- (c) How a 20-bit physical address for 8086 is handled by 16-bit register. 03
- (d) Describe the function of each status flag in 8086 microprocessor. 03

Course No: ECE 3117 Course Title: **Software Engineering & Information System Design**
Full Marks: 72 Time: 3 Hours

- N.B. (i) Answer any SIX questions taking **THREE** from each section.
(ii) Figures in the margin indicate full marks.
(iii) The questions are of equal value
(iv) Use separate answer script for each section

Section - A

- Q1 (a) "Software engineering is a layered technology". Whether the statement is true or false? Justify your answer. 04
(b) What is software engineering? Briefly explain different types of software. 04
(c) Briefly discuss some of the myth about software. 04
- Q2 (a) Briefly explain the spiral model. What are the advantages and disadvantages of this model? 03
(b) Mention the core principle of software engineering. 03
(c) Consider that you have the responsibility to choose the software process model of a software team. The team must deliver a product within 30-90 days. Which model are you going to choose and why? What are the advantages and disadvantages of this model? 06
- Q3 (a) Define the followings. (i) Software verification (ii) Software validation. 02
(b) What is black box testing? Briefly explain the graph-based testing method. 05
(c) What is cyclomatic complexity? Explain different ways to compute cyclomatic complexity with a suitable example. 05
- Q4 (a) Describe the characteristics that a project manager must have according to Edgemon. 05
(b) What is risk identification? Briefly explain the subcategories of generic risk. 05
(c) Mention the issues that must be considered in risk management strategy. 02
(d) Draw the system engineering hierarchy. 02

Section B

- Q5 (a) Distinguish between open system and close system. 03
(b) What is system development lifecycle? Write down the key questions associated with each system development lifecycle. 05
(c) What is prototyping? Describe the steps of prototyping with necessary diagram. 04
- Q6 (a) Write down the reasons behind project termination. 04
(b) What is feasibility study? Why do we need to perform feasibility study? Briefly describe the contexts of feasibility report. 05
(c) Briefly describe the management and information levels in a typical organization with proper illustration. 03
- Q7 (a) Write down the rules that are used in construction of DFD. 04
(b) Briefly describe the approaches for determining user's information requirements. 04
(c) Briefly describe the categories of information that are available for analysis. 04

Software

Q8 (a) Distinguish between structured interview and unstructured interview.

03

(b) Consider the following prices/costs.

3+3+3

Land price for factory	5,00,00,00 Tk
Construction cost of factory	3,00,00,00 Tk
Factory's machine price	4,00,00,00 Tk
Sugar Price	50 Tk/Kilo
Milk Price	60 Tk/litre
Chocolate bean price	70 Tk/kilo

If a chocolate factory uses 1 Kilo of sugar, 1 litre milk and 1 kilo chocolate bean to produce 100 chocolate candy and each chocolate candy is sold at a price of 5 tk then

- Evaluate and identify the fixed costs and variable costs in this scenario.
- Calculate the number of chocolate candy needs to be sold to reach break even point. Show it on graph.
- How many chocolate candy needs to be sold to attain a profit of 1,00,00,0tk?

- N.B. (i) Answer any **SIX** questions taking **THREE** from each section.
(ii) Figures in the margin Indicate full marks.
(iii) The questions are of equal value
(iv) Use separate answer script for each section

Section - A

- Q1 (a) What do you mean by computer architecture? Specify some architectural attributes that have direct impact on the logical execution of a program. 03
(b) Describe the basic functions of the major structural components of CPU. 04
(c) What is interrupt? Draw the flow diagram showing the flow of data during interrupt cycle. 05
- Q2 (a) Represent the decimal values -128, -127, -27, 100, 128 as signed, 8-bit numbers in the following binary formats: $7\frac{1}{2}$
(i) Sign-magnitude representation,
(ii) 1's complement representation,
(iii) 2's complement representation.
(b) What are the advantages of 2's complement representation over sign-magnitude representation and 1's complement representation? $2\frac{1}{2}$
(c) Explain how to determine if a number is negative in the following representations: 02
(i) Sign-magnitude (ii) 1's complement (iii) 2's complement
- Q3 (a) Determine whether the following statements are true or false. Provide some logic to support your answers: 3×4
(i) Pipelining results in an individual instruction being executed faster.
(ii) Maximum number of addresses might be needed in a machine instruction is four.
(iii) Fewer addresses per instruction always speed up the execution of the entire program.
- Q4 (a) Express the following numbers in IEEE 32-bit floating point format: 04
(i) -3.5 (ii) $5/16$;
(b) Divide $(13)_{10}$ by $(3)_{10}$ in 4-bit binary 2's complement notation by using unsigned binary division algorithm. 05
(c) What is machine instruction? What are the typical elements of a machine instruction? 03

Section B

- Q5 (a) Distinguish between computer organization & computer architecture with proper example. 04
(b) Identify the performance factor associated with processor execution time. Show their relation with the system attributes. 04
(c) Briefly describe the approaches used in multiple interrupt handling with illustration of transfer of control. 04
- Q6 (a) "If a large number of devices are connected to the bus performance will suffer"-is this statement true? If so then mention the reasons why? 04
(b) Draw and explain the instruction state diagram with interrupts. 04
(c) Consider execution of 2 million instructions on a 600 MHz processor. The program consists of four major type of instructions. The instruction mix and the CPI for each instruction type are given below. 04

Architecture

Instruction type	CPI	Instruction mix
Arithmetic and logic	2	45%
Branch	4	25%
Load/store with cache	6	10%
Memory reference with miss	10	20%

Now calculate the average CPI and corresponding MIPS rate when the program is executed on a uniprocessor.

- Q7 (a) Briefly explain the timing of synchronous bus operation. 03
- (b) Explain read and write operation in static RAM cell with proper diagram. 04
- (c) Consider a hard disk with an average seek time of 5 ms, rotation speed of 60,000 rpm. Each sector size is 4096 byte and there are 512 sectors in every track. Calculate the total average time if a 16MB file is read sequentially and randomly. Which technique do you think is better? 05
- Q8 (a) Write down the differences between dedicated bus and multiplexed bus. 03
- (b) Briefly explain how interrupt signal improves processor's efficiency (with suitable example). 04
- (c) What is RAID? Write short notes on the following RAID levels: 05
- (i) RAID 0 (ii) RAID 1 (iii) RAID 3 (iv) RAID 6