

University of Asia Pacific
Department of Electrical & Electronic Engineering
Mid-Semester Examination, Spring-2022
Program: B.Sc. in EEE (4th Year/ 1st Semester)

Course Title: VLSI Design I
Time: 1:00 Hour.

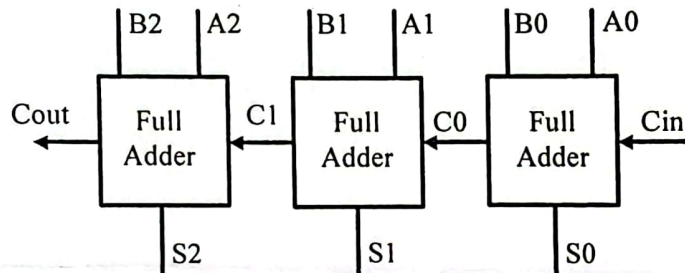
Course No: EEE 423

Credits: 3.00
Full Marks: 60

[There are Four Questions. Answer any Three including question 1 & 2. Figures in the right margin indicate marks.]

1. Which design technique (NMOS, PMOS or CMOS) you will prefer to implement the logic function $F = (\bar{A} + B + C\bar{D})$, explain with reasons. [5+15]
Depending on your preference draw the circuit and stick diagram for the logic function of F.

2. a. Write the Verilog code for the following block diagram,



[10]

- b. Which MOSFET (NMOS, PMOS or CMOS) you will prefer to implement a 5×1 MUX, explain with reasons. Depending on your preference draw the circuit or stick diagram for a 5×1 line MUX. [10]
3. a. Is it possible to design a full adder using PMOS only? If possible then design a full adder using only PMOS (circuit or layout diagram). [12]
- b. Implement a full adder using AND-OR PLA. [08]

OR

4. a. Is it possible to convert a 4-bit parallel adder circuit to a 4-bit ALU circuit? If possible then draw the block diagram of the 4-bit ALU circuit with necessary equations. [12]
- b. Implement a half subtractor using transistor level diagram of NOR-NOR-based PLA. [08]

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Department of Electrical and Electronic Engineering
Mid-Semester Examination, Spring'2022
Program: B. Sc. Engineering (4th Year / 1st Semester)

Course Title: Energy Conversion and Special Machines Course Code: EEE 401 Credit: 3.00
Time: 1.00 Hour Full Marks: 60

[There are **Four** Questions. Answer any **Three**. Questions 1 and 4 are compulsory.]

1. (a) Explain speed control of Universal Motor via tapping filed method. Draw the speed vs torque curve of a Universal motor for both AC and DC supply and comment on power factor for both conditions. [5+5]
- (b) A 250-W, single-phase, 50-Hz, 220-V universal motor runs at 2000 rpm and takes 1.0 A when supplied from a 220-V dc. supply. If the motor is connected to 220-V AC supply and takes 1.0 A (R.M.S), calculate the speed, torque and power factor. Assume $R_a = 20 \text{ ohm}$ and $L_a = 0.4 \text{ H}$. [10]
2. (a) What is meant by retentivity? "At the running condition Hysteresis Motor behaves like a synchronous Motor and it starts like an induction motor" Justify the statement. [2+8]
- (b) Draw the equivalent circuit of an AC series motor. An AC series motor has resistance of 80 ohm and an inductance of 0.4 H and it runs at 1500 r.p.m. Estimate its back emf and power factor when connected to a 250-V, 50-Hz AC supply and loaded to take 0.6A current. [10]

Or,

3. (a) An 8-kW, 4-pole, 220-V, 50-Hz reluctance motor has a torque angle of 30 degree when operating under rated load conditions. Calculate [10]
- (i) load torque
- (ii) torque angle if the voltage drops to 205 V and
- (iii) will the rotor have pulled out of synchronism?
- (b) Briefly explain the working principle of a linear induction motor with necessary figures. [10]
4. (a) Explain the working principle of flat plate solar collector and discuss on the disadvantages over concentrating solar collector. [5+5]
- (b) Draw the configuration of indirect Solar water heating system with heating backup and explain briefly. [10]

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Department of Electrical and Electronic Engineering

Mid-Semester Examination Spring-2022

Program: B. Sc. Engineering (4th Year/1st Semester)

Course Title: Numerical Methods Course No. EEE 453 Credit Hours: 3.00

Time: 1.00 Hour

Full Marks: 60

[There are Four (4) questions. Answer Three (3) questions including Q-1 and Q-2. Figures in the right margin indicate marks]

1. Consider the following function.

[8+6+6]

$$f(x) = e^{-0.4x}$$

You need to determine $f''(a)$, where a is the last two digits of your registration number. Example: If your registration no. is 13108151, then $a = 51$.

- Use Backward and Central divided difference method to estimate the result. You can choose any value for 'h', but you should try to choose in such a way that it should keep the error at minimum level.
- Evaluate the analytic result and compute error for both methods.
- Now based on your results, comment on which of the methods is more suitable for this purpose. How have you made your decision? Based on accuracy or based on precision? State reasoning behind your answer.

2. Consider the following system of linear equations. If your registration no. is 13108151, then Roll number = 51.

[12+8]

$$(\text{Roll number}) a + 0.44b = -0.11$$

$$0.22b - 0.44c = 0.022$$

$$0.11a + 0.33c = -0.0011$$

- Solve the system using Naïve Gauss Elimination Method.
- This method is associated with a problem explain the problem and how to solve the problem.

3. Consider the following equation. This equation will be used for both Q-3 and Q-4.

[12+8]

$$\cos^3(x) - x = 0$$

- Solve the above equation using False Position Method with initial guesses '-a' and 'a' up to error 1%. The true solution of the equation may be considered to be 0.5824 here, 'a' is the last two digits of your

registration number. Example: if your registration no. is 12108004, then the initial guesses will be -4 and +4.

- ii. Now comment on the performance of the method for solving this equation.

Hint: Be aware of how to work with powers in trigonometric functions in calculator. Remember to keep your calculator in Radian Mode while working with trigonometric functions.

OR

4. Consider the same equation used for Q-3.

[12+8]

- i. Solve the above equation using any of the open methods using initial guess 'a' or '-a' or both whichever required. Show 6 steps only. Here, 'a' is the last two digits of your registration number. Example: if your registration no. is 12108004, then the initial guesses will be -4 or +4 or both.
- ii. Now comment on how satisfied you are, with your selection of method for solving this equation.

Hint: Be aware of how to work with powers in trigonometric functions in calculator. Remember to keep your calculator in Radian Mode while working with trigonometric functions.

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Mid-Semester Examination Spring-2022
Program: B. Sc. in EEE (4th Year/ 1st Semester)

Course Title: Industrial and Operational Management; Course No. IMG 401; Credit: 2.00

Time: 1.00 Hours.

Full Mark: 40

There are **Four** Questions. Answer any **Three**. All questions are of equal value/Figures in the right margin indicate marks.

1. a. In today's environment, which is more important to organizations—efficiency or effectiveness? Explain your choice. 05

b. Define different types of management functions. Which type of skills manager needs to perform his/her duties? 08 $\frac{1}{3}$

2. a. Explain with suitable example how the concepts described in the equity theory can be applied to motivate employees in an organization. 09

b. Explain the significances of Herzberg's Two-Factor theory of motivation. 04 $\frac{1}{3}$

3. a. Explain how CVP analysis can help managers in taking important decisions? 06 $\frac{1}{3}$

b. Can an organization's structure be changed quickly? Why or why not? Should it be change quickly? Explain. 07

4. Northwood Company manufactures basketballs. The company has a ball that sells for \$25. At present, the ball is manufactured in a small plant that relies heavily on direct labor workers. Thus, variable expenses are high, totaling \$15 per ball, of which 60% is direct labor cost. Last year, the company sold 30,000 of these balls, with the following results:

Sales (30,000 balls)	\$750,000	25
Variable expenses	450,000	15
Contribution margin	300,000	10
Fixed expenses	210,000	
Net operating income	<u>\$ 90,000</u>	

- Compute (i) the CM ratio and the break-even point in balls, and (ii) the degree of operating leverage at last year's sales level.
- Due to an increase in labor rates, the company estimates that variable expenses will increase by \$3 per ball next year. If this change takes place and the selling price per ball remains constant at \$25, what will be the new CM ratio and break-even point in balls?
- Refer to the data in (b) above. If the expected change in variable expenses takes place, how many balls will have to be sold next year to earn the same net operating income, \$90,000, as last year?
- Refer again to the data in (b) above. The president feels that the company must raise the selling price of its basketballs. If Northwood Company wants to maintain the same CM ratio as last year, what selling price per ball must it charge next year to cover the increased labor costs?

13 $\frac{1}{3}$

University of Asia Pacific
Department of Electrical & Electronic Engineering
Mid-Semester Examination, Spring -2022
Program: B. Sc Engineering (4th Year/ 1st Semester)

Course Title: Power Station Engineering
Time: 1.00 Hour

Course Code: EEE-411

Credit: 3.00
Full Mark: 60

[Answer any three. Including Question 1 and Question 4]

- 1.(a) Why is electrical energy preferred over other forms of energy? [04]
(b) What do you mean by efficiency of a system? [04]
(c) Mechanical energy is supplied to a d.c. generator at the rate of 4200 J/s. The generator delivers 32.2 A at 120 V. [04]
 (i) What is the percentage efficiency of the generator?
 (ii) How much energy is lost per minute of operation?
- (d) What are the advantages of liquid fuels over the solid fuels? [08]
- 2.(a) Explain the important components of a steam power station. [05]
(b) What factors are taken into account while selecting the site for a steam power station? [05]
(c) A 100 MW steam station uses coal of calorific value 6400 kcal/kg. Thermal efficiency of the station is 30% and electrical efficiency is 92%. Calculate the coal consumption per hour when the station is delivering its full rated output. [10]

Or

- 3.(a) Explain the essential factors which influence the choice of site for a hydro-electric plant. [05]
(b) Explain the functions of the following : [05]
 (i) Dam (ii) Spillways (iii) Surge tank (iv) Impulse turbine (v) Penstock.
(c) It has been estimated that a minimum run off of approximately 94 m³/sec will be available at a hydraulic project with a head of 39 m. Determine (i) firm capacity (ii) yearly gross output. Assume the efficiency of the plant to be 80%. [10]
- 4.(a) Explain the operation of a combined cycle gas turbine power station with proper diagram. [10]
(b) Draw the schematic diagram of a nuclear power station and discuss its operation. [10]