

University of Asia Pacific
Department of Electrical and Electronic Engineering
Mid-Semester Examination Fall-2021
Program: B. Sc in EEE (Third Year/ First Semester)

Course Title: Communication Engineering Fundamentals

Course No. EEE-309

Credit: 3.00

Time: 1.00 Hour.

Full Mark: 60

There are **Four** Questions. Answer **three** from these including questions **1** and **2**.

- 1 ✓ a✓ Show the block diagram of a fundamental communication system. Briefly discuss [10] different types of signal distortion over a communication channel.
- b✓ Find the condition for amplitude response and phase response of distortionless [10] transmission.
- 2 ✓ a✓ On which principle switching modulators work? Draw a DSB-AM modulator [10] circuit and show using Fourier series how it generates the output.
- b✓ Say, $m(t)$ is a base band signal with expression $m(t) = 2 \sin 100t + 5 \cos 300t$ [10] which is transmitted using DSB-AM modulation with the carrier $10 \cos 5000t$. Find the power efficiency in this communication.
3. a. Why is it expensive to generate SSB modulated wave? Show the difficulty in [10] demodulating QAM wave.
- b. With block diagram show how to send 5 tone signals using SSB-AM, each of 4 [10] kHz, through a channel having bandwidth 20 KHz. If these modulated signals are summed up and further modulated by a carrier of 100 KHz then sketch the spectrum of the final modulated wave.

OR

- 4 ✓ a✓ What happens if the phase of incoming modulated signal and locally generated [10] carrier in the receiver do not match? How to solve this problem?
- b✓ With mathematical explanation, show how an envelope detector circuit works. [10] Can a SSB-AM modulated wave be demodulated using envelope detector? Justify your answer.

University of Asia Pacific
Department of Electrical and Electronic Engineering
Mid-Semester Examination, Fall' 2021
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) Briefly describe the reasons behind the sun radiation varies on the earth surface. [05]
- (b) "Latitude has an upmost importance of solar PV design and installation." How do you justify this sentence? [05]
- (c) Design a 48 V SHS system with eight 24 V PV modules and eight 12 V, 160 Ah lead-acid battery. How much ampere and ampere-hour will be generated from PV array and battery respectively? [10]
2. (a) Jinco Solar company manufacture PV module which exhibits the following characteristics at STC- $V_{mp} = 37.0$ V, $I_{mp} = 8.38$ A, $V_{oc} = 45.9$ V, $I_{sc} = 8.96$ A. The PV panel consists of 72 cells of 156/156 mm and the panel dimension is 1956/992 mm. Measure the following parameters (i) solar cell efficiency (ii) Packing factor (iii) solar module efficiency. [10]
- (b) Explain with figure the purpose of connecting bypass diode and blocking diode in a solar PV system. [10]
- Or,
3. (a) A PV power plant should generate power amounting 30 kW_P at STC. If Jynco solar polycrystalline modules of 120 W_p at an efficiency of $\eta_M = 14\%$ are to be used for the plant then determine the following numbers- (i) total number of modules (ii) total solar PV area. [10]
- (b) How solar radiation and temperature affect the efficiency of a solar cell? Explain with appropriate figure. [10]

4. (a) Describe about the process and the device by which photon energy converts into electrical energy. How do you justify the generated electrical energy is d.c. or a.c.? [8+2]

University of Asia Pacific
Department of Electrical & Electronic Engineering
Mid-Semester Examination, Fall -2021
Program: B. Sc in Electrical and Electronic Engineering (4th Year/ 1st Semester)

Course Title: Power Station Engineering
Time: 1.00 Hour.

Course No. EEE-411

Credit: 3.00
Full Mark: 60

[There are four questions. Answer any three. Question 1 and Question 4 are compulsory]

- 1.(a) Discuss the different sources of energy available in nature. [08]
 - (b) What is a power generating station? [04]
 - (c) What are the advantages of solid fuels over the liquid fuels? [08]

 - 2.(a) Draw the schematic diagram of a modern steam power station and explain its operation. [10]
 - (b) A steam power station spends TK. 30 lakhs per annum for coal used in the station. The coal has a calorific value of 5000 kcal/kg and costs TK. 300 per ton. If the station has thermal efficiency of 33% and electrical efficiency of 90%, find the average load on the station.
- Or**
- 3.(a) Draw a neat schematic diagram of a hydro-electric plant and explain the functions of various components. Besides discuss its merits and demerits. [10]
 - (b) A hydro-electric generating station is supplied from a reservoir of capacity 5×10^6 cubic meters at a head of 200 meters. Find the total energy available in kWh if the overall efficiency is 75%. [10]

 - 4.(a) Explain the operation of a combined cycle gas turbine power station with proper diagram. [10]
 - (b) A 100 MW power station delivers 100 MW for 2 hours, 50 MW for 6 hours and is shut down for the rest of each day. It is also shut down for maintenance for 45 days each year. Calculate its annual load factor.

University of Asia Pacific
Department of Electrical & Electronic Engineering
Mid-Semester Examination, Fall-2021
Program: B.Sc. Engineering (4th Year/ 1st Semester)

Course Title: VLSI Design I

Course No: EEE 423

Credits: 3.00

Time: 1:00 Hour.

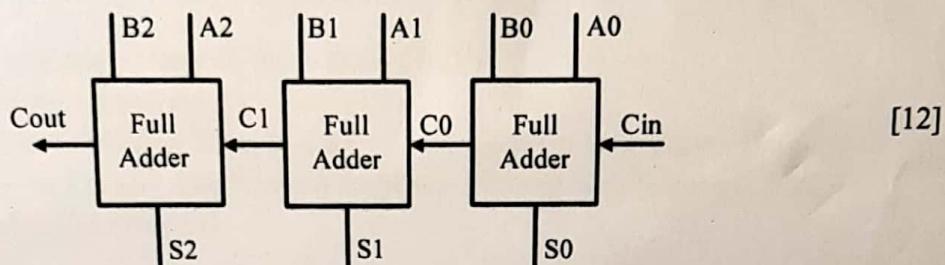
Full Marks: 60

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

1. Explain why NMOS pass good '0' but poor '1', whereas PMOS pass good '1' but poor '0'. Draw the CMOS circuit and layout/stick diagram for the logic [5+15] function,

$$Y = (\bar{A} + B)C\bar{D}$$

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



- b. Draw the circuit or layout diagram of 5x1 line multiplexer for CMOS implementation. [08]

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 bus arbitration logic cell using PMOS only, also draw the layout for this circuit. [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 after conversion with necessary equations. [12]
- b. Implement a half adder using transistor level diagram of NOR-NOR based PLA. [08]

University of Asia Pacific
Department of Electrical and Electronic Engineering
Mid-Semester Examination Fall-2021
Program: B. Sc Engineering (4nd 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** questions. Answer any **Three**. Figures in the right margin indicate marks]

1. A renewable energy station has been using some photo voltaic (PV) panels, [20] which has the following current- voltage relationship (after some simplification).

where, V = terminal voltage of those panel (in V)

I = load current (in A)

Determine the terminal voltage, V if $4A$ of load current is to be drawn from each panel (i. e. $I = 4A$). Use **Newton Raphson Method** with initial guess $V_0 = 3V$ up to relative error 1%.

OR

~~2~~ The impedance, Z of an R-L-C circuit is given by the following equation , [20]

where ω is supply angular frequency.

Now determine the value of ω when $Z = 10$. Use **False Position Method** with initial guesses $\omega_0 = 14$ and $\omega_{up} = 22$.

Show 3 steps and determine relative error for all steps.

~~3~~ If then determine using

[6+6

+4+4

- Backward and Central Divided Difference Method with $h = 0.6$
- Repeat both methods with $h = 0.01$
- Now evaluate the true value of and determine error for each cases (total four cases)
- Comment on which method is better and how the value of 'h' is affecting the accuracy of the process.

~~4~~ Answer the following questions as precisely as possible.

[10+

10]

- With a proper example show how choice of accuracy and precision can complicate a numerical calculation.
- With a proper example show how an error can be amplified for any system of calculation as it is carried over.

University of Asia Pacific
Department of Electrical and Electronic Engineering
Mid-Semester Examination Fall-2021
Program: B. Sc Engineering (4th Year/ 1st Semester)

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

Time: 1 Hour Full Mark: 40

There are Four Questions. Answer any Three including Q-1 and Q-2. All questions are of equal value.
Figures in the right margin indicate marks.

1.
 - a) What are the management functions proposed by Henri Fayol? Explain. (07)
 - b) What should be the role of managers to fulfill the organizational goals? (08)
2.
 - a) What are the five bases of power? Explain. (07)
 - b) A time study analyst timed an assembly operation for 30 cycles, and then computed the average time per cycle, which was 18.75 minutes. The analyst assigned a performance rating of 0.96, and decided that an appropriate allowance was 15 percent. Assume the allowance factor is based on the workday. Determine the following: the observed time (OT), the normal time (NT), and the standard time (ST). (08)
3.
 - a) Briefly explain the qualitative methods of forecasting. (05)
 - b) Cell phone sales for a California-based firm over the last 10 weeks are shown in the following table. Determine the equation of the trend line, and predict sales for weeks 11 and 12. (05)

Week	Unit Sales
1	700
2	724
3	720
4	728
5	740
6	742
7	758
8	750
9	770
10	775

4.
 - a) Discuss the dimensions of product quality. (05)
 - b) Write a short note on TQM. (05)

University of Asia Pacific
Department of Electrical and Electronic Engineering
Semester Final Examination, Fall' 2021
Program: B. Sc. in EEE (4th Year / 1st Semester)

Course Title: Energy Conversion and Special Machines Course No. EEE 401 Credits: 3.00
Time: 3.00 Hour Full Marks: 150

[There are Eight Questions. Answer Six Questions including Questions 1, 2, 5 and 6. Figures in the right margin indicate marks.]

- ~~(a)~~ Consider, you have a 2-phase stator with 2-pole permanent magnet (PM) rotor Stepper Motor. Which control sequence method will you suggest for higher torque operation? Also draw the stepping sequence with brief explanation and calculate the full step angle. [5+8]
- ~~(b)~~ A Variable Reluctance stepping motor has 4 main poles which have been castellated to have 6 teeth each. If rotor has 40 teeth, then determine the following- [12]
i. Step angle
ii. Resolution
iii. Number of steps required for the shaft to make 6 revolutions and
iv. Shaft speed, if the stepping frequency is 280 pps.
- ~~(c)~~ A universal motor has armature circuit resistance of 15Ω and inductance of 0.3 H. On being connected to a 220 V dc supply, it draws 1.5 A from the mains and runs at 2000 rpm. Find the speed and power factor of the motor, when connected to a 230 V, 25 Hz supply and drawing the same armature current. [12]
- (b) What are the types of variable reluctance stepper motor? Explain how they develop the torque and how resolution of step angle of variable reluctance motor can be increased. [3+10]
3. (a) An overhead crane in a factory is driven horizontally by means of two similar linear induction motors whose rotors are the two steel I beam on which the crane rolls. The three phase two pole linear stators which are mounted on opposite sides of the crane have a pole pitch of 4.7 cm and are energized by variable frequency source. The tests on one of the motors gave the following results- Stator frequency = 50 Hz, Stator copper and iron loss = 1.5 kW, Power to stator = 6 kW and Crane Speed = 3.5 m/sec.
Calculate- i. Synchronous speed and slip
ii. Power input to rotor [10]

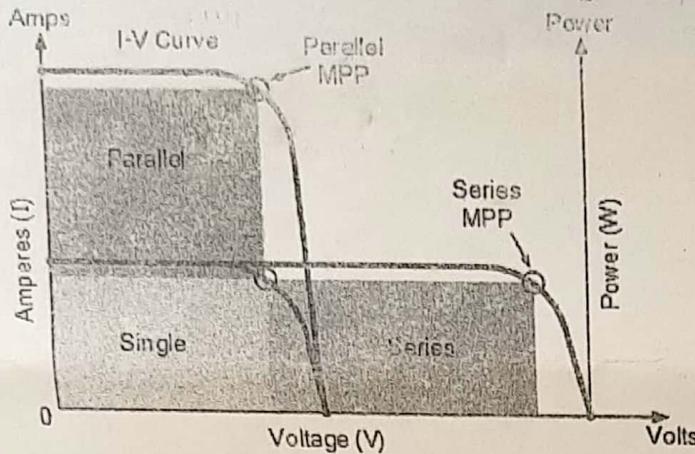
- iii. Copper loss in the rotor
- iv. Gross mechanical power developed
- v. Thrust.

- (b) Although all motors give rotational motion except one type of motor which gives linear translational motion. With figure show how the motor can be constructed to produce that motion. [10]
- (c) To avoid unnecessary wear and tear friction losses how repulsion motor can be operated as repulsion-start induction-run motor? Justify your answer. [5]

Or,

- ~~Q.~~ A 10 kW 4-pole, 220 V, 50 Hz reluctance motor has a torque angle of 25 degrees when operating under rated load condition. Calculate load torque. Find the torque angle if the voltage drops to 205 volts. [10]
- ~~Q.~~ Is there any dc motor available who does not involve in mechanical commutation to the windings, no electromagnet and brush then again it converts electrical energy into mechanical energy? How the motor develop such mechanical torque? [10]
- ~~Q.~~ In selection of rotor material for hysteresis motor why do we need to know the B-H curve of that magnetic material? Justify your answer. [5]
- ~~Q.~~ As an Assistant Engineer you have asked to design a Solar Home System for a semi-urban area. How do you represent the design in a flow chart? [10]
- ~~Q.~~ To run 3 lamps of 15 W and 2 fans of 24 W at a distance of 30 m how do you select the required wire size for a solar home system? You may assume the load voltage as 24 V. [5]
- (c) At Standard Test Conditions, a SOVA Solar polycrystalline module exhibits the following characteristics: Maximum power 300 W_p, open-circuit voltage 44.46 V, Short Circuit current 8.74 A. The module is composed of 72 cells dimensions of 15 cm/15 cm and its outer dimensions are 195.5 cm/98.2 cm. Determine the (i) solar cell efficiency (ii) packing factor (iii) solar module efficiency (iv) fill factor. [10]
- ~~Q.~~ An NGO named GIZ wants to install an offshore wind turbine in Kutubdia Island where the wind speed at 15 m height is 4 m/s. You have asked submit a project proposal to install a wind turbine at 80 m height. If the rotor blade length is 22 m and power coefficient is 0.45 then what will be the maximum electrical power output? [10]
- ~~Q.~~ Do you agree that wind turbine will operate and generate electrical power at any wind speed? Justify your answer. [5]

(c) What are the decisions you may take from the following I-V curve?



[10]

7/ A four star hotel in Cox's Bazar wants to setup a renewable energy based water heating system to meet its daily hot water requirements. What type of water heating system you may suggest to the hotel authority and how the system will work?

[10]

8/ To generate biogas the required biomass resources must be in wet form, else biogas will not produce. How do you disagree or agree with this statement? Justify your answer.

[10]

(b) Consider you are working in a consultancy firm and as a design engineer you have been asked to design a wiring system for an off-grid SHSs in a residential building. Remember the electrical loads should run by AC.

[05]

Or,

8. (a) Government of Bangladesh has imposed a policy that every residential building should use 5% electricity generated from renewable resources. The area has good solar energy potential and 1 kW/m^2 or more radiation will be available from 10.30 am to 3.30 pm. The building authority has decided to install SHS as an obligation to the govt. policy and you have been asked to design and make a list of the SHS components required for a 5-storied residential building.

[10]

(b) To produce charcoal the required biomass resources must be in solid form and go through a process where absence of oxygen is mandatory or else charcoal will not produce. Justify your answer?

[10]

(c) Design a sketch through single line diagram of a Grid-Tied solar PV system with battery storage.

[05]

University of Chittagong
Department of Electrical and Electronic Engineering
Semester Final Examination, Fall 2021
Program: B.Sc. in EEE (4th Year/1st Semester)

Course Code: EEE-411
Time: 3 Hours

Course Title: Power Station Engineering

Credit Hours: 3 Hours
Full Marks: 150

[Answer any six questions. Including Question 1, Question 4, Question 7, Question 8]

- (a) Why is electrical energy preferred over other forms of energy? [05]
 (b) Discuss the different sources of energy available in nature. [10]
 (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.
 (i) What is the efficiency of generator?
 (ii) How much energy is lost per minute of operation?
- (d) Draw a neat schematic diagram of a hydro-electric plant and explain the functions of various components. [15]
 (e) It has been estimated that a minimum run off of approximately $94 \text{ m}^3/\text{sec}$ 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%.

Or

3. (a) Draw the schematic diagram of a nuclear power station and discuss its operation. [15]
(b) What is the power output of a $^{92}\text{U}^{235}$ reactor if it takes 30 days to use up 2 kg of fuel? Given that energy released per fission is 200 MeV and Avogadro's number = 6.023×10^{26} per kilomole. [10]

- (a) What do you understand by the load curve? What informations are conveyed by a load curve? [4+4]
 (b) A 100 MW power station delivers 100 MW for 2 hours, 50 MW for 6 hours and is shut down for the rest of each day. It is also shut down for maintenance for 45 days each year. Calculate its annual load factor. [10]
(c) Explain the term diversity factor. How do these factor influence the cost of generation? [07]
- (d) Discuss the various methods of determining the depreciation of the equipment. [25]

Or

6. (a) Explain how the load factor plays a vital role in determining the cost of energy. [10]
(b) The equipment in a power station costs Tk 15,60,000 and has a salvage value of Tk 60,000 at the end of 25 years. Determine the depreciated value of the equipment at the end of 20 years on the following methods :
 (i) Straight line method
 (ii) Diminishing value method
 (iii) Sinking fund method at 5% compound interest annually. [15]

- (a) What do you understand by tariff? Discuss the objectives of tariff. [07]
 (b) Describe the desirable characteristics of a tariff. [08]
 (c) The maximum demand of a consumer is 20 A at 220 V and his total energy consumption is [10]

8760 kWh. If the energy is charged at the rate of 20 paise per unit for 500 hours use of the maximum demand per annum plus 10 paise per unit for additional units, calculate : (i) annual bill (ii) equivalent flat rate.

8. (a) What do you mean by renewable energy? Explain how wind energy is converted into [20]
electrical power. [05]
- (b) What is biomass?

University of Asia Pacific
Department of Electrical and Electronic Engineering
Semester Final Examination, Fall - 2021
Program: B. Sc. in EEE (4th Year/1st Semester)

Course Title: Numerical Methods

Course No. EEE 453

Credit Hours: 3.00

Time: 3.00 Hour

Full Marks: 150

[There are Eight questions. You need to answer Six questions in total. Question No. 1, 2, 3 are mandatory. Answer One between Question No. 4 and 5. Answer Two among Question No. 6, 7 and 8. Figures in the right margin indicate marks]

1. i. With suitable real-world examples, give your opinion on why Numerical Methods need to be considered as essential for engineering study. [13] +
 ii. Criticize numerical methods as a whole, in terms of 'Accuracy' and 'Precision' with proper examples. How, according to you, can the accuracy of a numerical method be established in real-life situations? [12]

2. The year 2019 was marked in Bangladesh due the epidemic-proportion of dengue outbreak. The following table provides the month-wise official data of dengue patients admitted to the hospitals in Bangladesh from March to October 2019. [15+10]

Dengue Patients admitted to the hospitals in 2019 in Bangladesh (Source: IEDCR, Bangladesh)							
Month	March	April	May	June	July	August	October
No. of Dengue Cases	17	58	193	1884	16253	52636	7168

Now answer the following questions based on this data.

- i. Use Newton's Interpolating Polynomial to estimate the number of dengue cases in September 2019.
 ii. If the actual number of dengue patients in September 2019 is provided in the report to be 16856, then comment on the performance of Newton's Polynomial for this estimation.

3. Air Quality Index (AQI) is a tool for reporting air quality of any city or country. If AQI remains in the range from 0 -100, then the air of that place is considered healthy / pollution-free. The following table shows the monthly AQI of Dhaka city of 2019 as found on the <https://aqicn.org/> website. [7+8+10]

Monthly AQI of Dhaka City of 2019 Source: https://aqicn.org/												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AQI	309	338	248	191	159	127	136	85	98	154	197	249

Now you need to apply the principle of least square regression to model this data.

- i. Fit this data to a quadratic model like $y = a_0 + a_1x + a_2x^2$.
 ii. Fit this data to an exponential model like $y = de^{\beta x}$.
 iii. Apply your model to estimate the AQI in the month of January of 2020. If the

recorded AQI for January 2020 is provided to be 296, then comment on the estimation accuracy of both models. Which of the models has worked better? Justify.

Consider the following equation.

$$70e^{-2x} = 20 - 25e^{-0.07x}$$

[5+
10+
10]

Now solve this equation is to be solved up to error limit 1%.

- i. Choose a proper open method to solve this equation. You have to choose a method such that the equation can be solved to reach the error limit or at least can be progressed up to certain level. (Note: 'This equation can't be solved with this method' such answer is not acceptable!!). Now give justification why you have chosen that method.
- ii. Solve the equation with your chosen method. [If error limit can't be reached, show five steps at least!!]
- iii. Now from your data table / solution comment how far your choice is satisfactory for this problem. If you are completely unsatisfied with your method, then propose another method and give justification for your proposal. [Just give a proposal, no need to solve with that method!!]

For your solution process, the you may choose -10 and 10 as initial guesses. You may pick any one of these or both or none of them and choose initial guess/es on your own.

The true solution of this equation can be considered as 3.2614.

OR

5. Consider the following equation.

$$\sin\left(\frac{2\pi x}{16}\right) \cos(72\pi) + e^{-x} = 0.5$$

[5+
10+
10]

Now solve this equation is to be solved upto error limit 5%.

- i. Choose a Bracketing Method to solve this equation. Give justification why you have made such a choice.
- ii. Solve the equation with your chosen method. [If error limit can't be reached, show five steps at least!!]
- iii. Now from your data table / solution comment how far your choice is satisfactory for this problem. If you are completely unsatisfied with your method, then propose another method not mentioned above and give justification for your proposal. [Just give a proposal, no need to solve with that method!!]

For your solution process, the initial guesses what may be used are 0, 9 and 20. You may pick any one of these or both or none of them and choose initial guess/es on your own.

Evaluate $\int_0^{10} \frac{1}{1+e^x} dx$ using

[5+
+5+
10]

- i. Trapezoidal rule with $n = 6$
- ii. Simpson's 1/3 rule with $n = 6$
- iii. Simpson's 3/8 rule with $n = 6$
- iv. If the actual result of this integral is 0.6931, then determine error for all three cases and decide which method is better analyzing that error. Justify why do you think that method worked better than others.

2. Consider the following system of linear equations.

[8+]

$$5x_1 - 2x_2 + 3x_3 = -1$$

7v

$$-3x_1 + 9x_2 + x_3 = 2$$

[10]

$$2x_1 - x_2 - 7x_3 = 3$$

- i. Apply Gauss Seidal Iterative method to solve this equation considering a set of proper initial guesses. Show three iterations.
- ii. Now apply Jacobi method for this system for the same initial guesses you have chosen previously. Show three iterations
- iii. Based on your calculations, comment on the accuracy and convergence of the methods.

[Note: determine true solutions of the linear system using calculator]

~~8~~ Consider the following system of linear equations.

[10+]

$$-2x_2 + 3x_3 = -1$$

15]

$$-3x_1 + 9x_2 + x_3 = 2$$

$$2x_1 - 7x_3 = 3$$

- i. Choose an elimination method to solve this linear system. Justify clearly, why you have selected that method.
- ii. Now solve this system with your chosen method.

University of Asia Pacific
Department of Electrical and Electronic Engineering
Semester Final Examination, Fall- 2021
Program: B. Sc. in EEE (4th Year/ 1st Semester)

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

Time: 2.00 Hours.

Full Mark: 100

There are Six Questions. Answer Q.1 or Q.2, Q.3 or Q.4, and then Q.5 and Q.6. All questions are of equal value. Figures in the right margin indicate marks.

- ✓ ✓) Identify and explain the types of costs that are involved in an inventory system. 10
✓) What are the important assumptions of EOQ Model? Why is it not necessary to include product cost in the EOQ model? 15
2. a) Discuss the dimensions of product quality. 10
b) What are the basic tools of TQM? Write a short note on Pareto Chart and CE Diagram. 15
3. a) What do you mean by expectancy theory of motivation? 10
b) Describe Maslow's need theory and ERG Theory and compare them. 15
- ✓ ✓) What are the differences between leaders and managers? 10
✓) Discuss Fiedler's model of leadership. 15
5. a) Explain the behavioral approach of leadership. 10
b) Briefly discuss the costs of quality. 15
6. a) Distinguish between consumer market and business market. 10
b) What is value in marketing? Discuss the four different business concepts of manufacturing industry. 15