Sylhet Engineering College, Sylhet

(Shahjalal University of Science & Technology)

Department of Electrical & Electronic Engineering

Final Examination, 2023 — **3rd year 2nd Semester**

Course No: IPE 601 — **Course Title: Industrial Management**

Time: 03 (Three) hours — **Full Marks: 60**

N.B. : (i) Answer any three question from each PART (ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)----------N/A----------

Part A

(Answer any **THREE** questions)

1	(a)	Explain the term "Universality of management".	2
	(b)	Write down the functions of a manager. Why do managers differ from leaders?	4
	(c)	What do you mean by Fayol Theory? Explain at least 7 important points	4
2	(a)	What is Industry? What are products? What is the different between construction Industry & Assembling Industry?	4
	(b)	What is management? Describe Top-Mid-Low, management system from your own idea.	4
	(c)	Do you think managers should be of good character? Write 2 good qualities	2
3	(a)	Define: needs, wants and demands. Explain Maslow's hierarchy of needs with a suitable figure and show why very fewer of the people can reach the top.	4
	(b)	Define the span of management. Write down the advantages of span of management of the narrow one	3
	(c)	Describe what an organization and its external environment is with a schematic diagram	3
4	(a)	What are the objectives of personnel management.	2
	(b)	Differentiate between recruitment and selection. Explain the recruitment process with diagram.	5
	(c)	Wage is different from incentive- How? Describe the requirements of a sound incentive scheme.	3

Part B

(Answer any **THREE** questions)

5	(a)	What are the stages of consumer buying process? Write the differences between value-based pricing (VBP) and cost-based pricing (CBP).	5
	(b)	Draw the product life cycle & explain it's different stages to maximize the revenue	5
6	(a)	A marketing strategy starts with planning and ends with operational strategy" - Explain	3
	(b)	What is marketing mix? Explain the key elements of a marketing mix strategy (CP and 4P).	3
	(c)	How does a- company proceed toward promoting its products? Explain the importance of online advertisements for promoting products.	4
7	(a)	Define technology management. Explain the vital factors that must be considered before selecting a technology appropriate for your purpose.	4
	(b)	Draw the basic model of technology transfer. Explain the Channels for Technology Transfer.	6
8	(a)	What is the Critical Path Method (CPM)? What are the most important elements of CPM (You think)?	3
	(b)	Consider a simple project involving the procurement and installation of two machines, after which production can begin. 1. Float tender enquiries for both the machines—let us say it takes 4 weeks. 2. Purchase and receive machine A—let us say it takes 3 weeks. 3. Purchase and receive machine B—let us say it takes 5 weeks. 4. Install machine A—let us say it takes 3 weeks. 5. Install machine B—let us say it takes 3 weeks. 6. Production—it takes 2 weeks. *Build a critical path network, an activity table, an events table and finally, find out the critical path. Which activities have no float?	7

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Final Examination, 2023 — **3rd Year 2nd Semester**
Course No: EEE 607 — **Course Title: Power System II**
Time: 03 (Three) hours — **Full Marks: 60**

PART-A
(Answer any three questions)

1. **(a)** What is sag? Write the name of different type of insulator. 1+1

   (b) Deduce an approximate expression for sag in overhead lines when: (*i*) supports are at equal levels or (*ii*) supports are at unequal levels. 04

   (c) A transmission tower on a level ground gives a minimum clearance of 8 meters for its lowest conductor with a sag of 10 m for a span of 300 m. If the same tower is to be used over a slope of 1 in 15, find the minimum ground clearance obtained for the same span, same conductor and same weather conditions. 04

2. **(a)** Find the most economical size of a single-core cable. 02

   (b) Define and explain string efficiency. Can its value be equal to 100%? 3+1

   (c) An insulator string consists of three units, each having a safe working voltage of 15 kV. The ratio of self-capacitance to shunt capacitance of each unit is 8:1. Find the maximum safe working voltage of the string. Also find the string efficiency. 04

3. **(a)** Define corona and corona loss. What are the factors affecting corona? 1+2

   (b) Define critical disruptive voltage? Deduce the equation of critical disruptive voltage. 1+2

   (c) A 132 kV line with 1·956 cm dia. conductors is built so that corona takes place if the line voltage exceeds 210 kV (r.m.s.). If the value of potential gradient at which ionization occurs can be taken as 30 kV per cm, find the spacing between the conductors. 04

4. **(a)** Deduce the expression of thermal resistance of dielectric of a single core cable. 02

   (b) A 66-kV single-core lead sheathed cable is graded by using two dielectrics of relative permittivity 5 and 3 respectively; thickness of each being 1 cm. The core diameter is 2 cm. Determine the maximum stress in the two dielectrics. 04

   (c) Establish the equation of capacitance of single core cable. 04

PART-B
(Answer any three questions)

5. **(a)** Why are insulators used with overhead lines? 02

   (b) Using steady state analysis prove that system is marginally stable when $\frac{\partial P_e}{\partial \delta \mid \delta_0} > 0$ 04

   (c) The insulation resistance of a 1km single-core cable is 495 MΩ. If the core diameter is 2·5 cm and resistivity of insulation is $4{\cdot}5 \times 10^{14}$ Ω-cm, find the insulation thickness. 04

6. **(a)** What does it mean by power system stability? What is swing equation? 1+1

   (b) Deduce the swing equation for rotor angle δ. Also, find acceleration & deaccelerating condition. 04

   (c) A 50 Hz four-pole turbogenerator rated 20 MVA, 13.2 kV has an inertia constant of H = 9.0 kW-sec/kVA. Determine the K.E. stored in the rotor at synchronous speed. Determine the acceleration if the input less the rotational losses is 25000 HP and the electric power developed is 15000 kW. If the acceleration computed for the generator is constant for a period of 15 cycles, determine the change in torque angle in that period and the r.p.m. at the end of 15 cycles. Assume that the generator is synchronized with a large system and has no accelerating torque before the 20-cycle period begins. 04

7. **(a)** What is skin effect? Deduce the value of inductance of 3 phase overhead line for symmetrical spacing. 1+3

(b) A single-phase line has two parallel conductors 2 meters apart. The diameter of each conductor is 1·2 cm. Calculate the loop inductance per km of the line. 02

(c) A 66-kV single-core lead sheathed cable is graded by using two dielectrics of relative permittivity 5 and 3 respectively; thickness of each being 1 cm. The core diameter is 2 cm. Determine the maximum stress in the two dielectrics. 04

8. **(a)** What are the types of underground cable fault? How to identify which type of fault has occurred? 1+2

(b) Explain how can fault location be found by Murray loop test for short circuit? 04

(c) In a test for a fault to earth on a 500 m length of cable having a resistance of 1 Ω per 1000 m, the faulty cable is looped with a sound cable of the same length but having a resistance of 2·25 Ω per 1000 m. The resistance of the other two arms of the testing network at balance are in the ratio 2·75:1. Calculate the distance of the fault from the testing end of the cable. 03

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Final Examination, 2023 — **3rd year 2nd Semester**

Course No: EEE 601 — **Course Title: Digital Signal Processing I**

Time: 03 (Three) hours — **Full Marks: 60**

N.B. : (i) Answer any three question from each PART (ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)---------N/A----------

PART-A

(Answer any three questions)

1. (a) i. Define the terms signal and noise. Find several terms, which are similar to these two. 02

ii. We have seen the features of digital processing of signals. But a very significant question that can be asked at this moment is: why do we go for digital technology? Discuss in details.

(b) State the Nyquist Sampling Theorem and provide a proof using both mathematical and graphical approaches. 06

(c) Consider a continuous-time signal x(t) with a maximum frequency component of 5 kHz. According to the Nyquist Sampling Theorem: 02

1. What is the minimum sampling rate required to sample this signal without aliasing?
2. If the signal is sampled at a rate of 12 kHz, what is the Nyquist frequency and how can the signal be reconstructed from its samples?

2. (a) Justify the statements 02

S1: A discrete-time sinusoid is periodic only if its frequency f is a rational number

S2: Discrete-time sinusoids whose frequencies are separated by an integer multiple of 2π are identical.

(b) Evaluate whether the following system is linear, causal, time-varying, stable, bounded, and passive: 06

$$y(n) = x(n-2) + 3x(n+2)$$

Where $x(n)$ is the input, and $y(n)$ is the output.

(c) Consider the following two equations: 02

1. $y(n) = 2y(n-1) - y(n-2) + x(n)$
2. $y(n) = y(0) + \sum_{i=0}^{n} x(i) - \sum_{i=0}^{n-1} y(i)$

Tasks:

- Classify each of the equations as recursive or non-recursive.
- Justify your classification by explaining how each equation relates to the past values of the output or the input.

3. (a) Using the running average filter described by the difference equation: 04

$$y[n] = \frac{1}{3}(x[n] + x[n+1] + x[n+2])$$

Find the output of the system, $y[n]$, given that the discrete-time input sequence is:

$$x[n] = \{1, 2, 3, 2, 1\}$$

(b) Find $y[n]$ for the multirate processing of discrete-time input shown in Fig. 3(b). 06

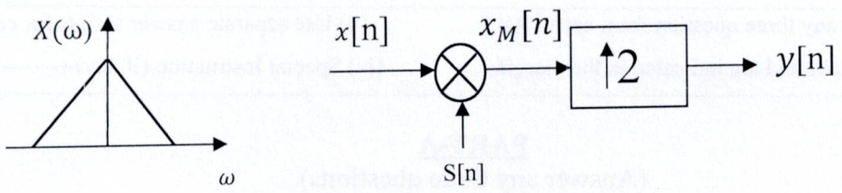

Fig. 3(b)

4. (a) Write down the condition of Inverse system and determine the Inverse of the following LTI system. 04

$$y(n) = \sum_{k=0}^{\infty} x(n-k)$$

(b) State convolution theorem. Obtain convolution for the sequence given: 06

$$x(n) = \{1,0,-1,2,3,-2\} \;\; ; \;\; h(n) = 0.5x[n] + 1.5x[n-1] + x[n-2] - 0.5x[n-3]$$

PART-B

(Answer any three questions)

5. (a) Consider the following discrete-time signal: 04

$$x[n] = \{1,2,3,4,5\} \text{ for } n = 0,1,2,3,4$$

1. Compute the Z-transform of the signal $x[n]$.
2. If the system is represented by the transfer function $H(z) = 1/z - 0.5$, compute the output of the system in the Z-domain by multiplying the Z-transforms of the input and the system's transfer function.
3. Find the inverse Z-transform to obtain the output signal $y[n]$ in the time domain.

(b) Given the system transfer function 06

$$H(Z) = \frac{Z(Z+2)}{(Z-0.2)(Z+0.6)}$$

Find the inverse Z-transform to obtain h(n), where n is the discrete-time index.

What are the key challenges in interpreting the poles and zeros of this transfer function, and how do they affect the time-domain behavior of the system?

Hint: Consider the nature of the poles and zeros when applying the inverse Z-transform — you might need to use partial fraction decomposition.

Now consider a new system transfer function

$$H(z) = \frac{1}{(1 + Z^{-1} + Z^{-2})}$$

Find the corresponding discrete-time sequence h(n) using the inverse Z-transform.

What simplification could you apply to the equation to make the inverse Z-transform more manageable? Discuss how you would handle the powers of z^{-1} in the denominator.

Trick: This transfer function might seem simpler, but carefully handle the coefficients and their relationship to the time-domain sequence.

6. (a) Design an 8-input Butterfly diagram to calculate FFT of $x = \{1, 2, -1, 3, 1, 2, 1, -3\}$ 10

7. (a) Obtain the coefficients of an FIR low pass filter to meet the specifications given below using the window method: 10

Pass band edge frequency	3.4 KHz
Transition Width	0.6 KHz
Stop band Attenuation	50 dB
Sampling Frequency	8 KHz

Include in your answer the type of window used and the reason of your choice.

8. (a) Define DTFT and DFT. Consider the following sequence: 10

$$x[n] = \begin{cases} 1 & \text{for } n = 0 \\ 1 & \text{for } n = 1 \\ 0 & \text{for } n = 2 \\ -1 & \text{for } n = 3 \\ 2 & \text{for } n = 4 \\ -2 & \text{for } n = 5 \\ 0 & \text{for other values of } n \end{cases}$$

Compute the DFT of the given sequence $x[n]$.

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Final Examination, 2023 — **3rd Year 2nd Semester**

Course No: EEE 605 — **Course Title: Measurement & Instrumentation**

Time: 03 (Three) hours — **Full Marks: 60**

N.B. : (i) Answer any three question from each PART (ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)--------N/A----------

PART-A

(Answer any **THREE** questions)

1. **(a)** What do you mean by accuracy and error in a measurement system? What are the data representation elements in a measurement system? 3

   (b) What is a Schottky Barrier Diode? Describe the working principle of the permanent magnet moving coil type meter. 4

   (c) Draw the schematic diagram of a compensated wattmeter. Why a high resistance is added in series with PC of wattmeter? Give two reasons. 3

2. **(a)** Explain how does the Cathode Ray Tube works as two convex lenses ready to focus the beams 4

   (b) What is Threshold wavelength? Draw the equivalent circuit of a Photodiode. Show that for photoelectric emission to be possible over the whole visible region of $4000A^0$ to $8000A^0$, the work function of the photo emissive surface should be less than 1.5eV. 1+5

3. **(a)** In the circuit shown in Fig. 3(a), the voltage across the resistor of value 25kΩ is to be measured first by using a voltmeter of sensitivity of 1kΩ/V, and then with a voltmeter of sensitivity of 20kΩ/V. Calculate the reading of the voltmeter in each case and the percentage error in the measurement. Comment on the answers. 4

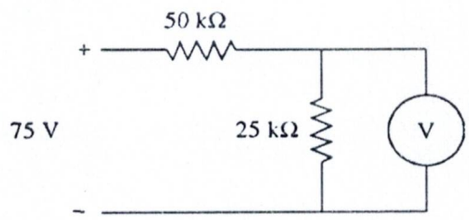

Fig. 3(a)

   (b) Simply explain a sample and hold circuit. What is the biggest problem of a DAC using an op-amp summing amplifier with binary weighted resistors, and how it can be solved. Clarify your answer with proper diagram. 6

4. **(a)** What are the effects of noise in a measurement system? How the problems with multiple grounds can be solved. 4

   (b) Explain absolute, gauge and differential pressure. Draw some sensing elements for pressure measurement. 6

PART-B

(Answer any **THREE** questions)

5. **(a)** Give examples of some secondary transducers. Describe the working principle of an LVDT. 5

   (b) Draw a basic instrumentation amplifier model. Then calculate the voltage gain for R = 25kΩ and aR = 50Ω. 5

6. **(a)** Explain with figure the working principle of Ultra-violate recorders. 5

   (b) State mathematically with figure which kind of connection of wattmeter is convenient for low current appliances. 5

7. (a) Why a high resistor is connected in series with the potential coil in measurement of power. 5

(b) A five-bit DAC has a current output. For a digital input of 10100, an output current of 10 mA is produced. What will I_{OUT} be for a digital input of 11101? 5

8. (a) Derive the expression for the electrostatic screen deflection of a Cathode Ray Oscilloscope. 5

(b) In a dynamometer wattmeter the moving coil has 500 turns of mean radius 10mm. Estimate the torque if the axes of the field and moving coils are at 450 when the density in the field coil is 15mWb/m^2, the current in the moving coil is 0.02 A and the power factor in 0.85. 5

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Final Examination, 2023 — **3rd Year 2nd Semester**
Course No: EEE 603 — **Course Title: Control System I**
Time: 03 (Three) hours — **Full Marks: 60**

N.B. : (i) Answer any three question from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)--------N/A----------

PART-A
(Answer any **THREE** questions)

1. (a) What do you mean by compensator? Why a lag compensator tends to become less stable? How to avoid this problem? **2**

(b) What kind of compensator is Fig. 1(b)? Determine the transfer function of this circuit. Prove that the value of α for this circuit is always less than unity. Find the value of maximum response if $R_1 = 5\Omega$, and $R_2 = 3\Omega$. **3**

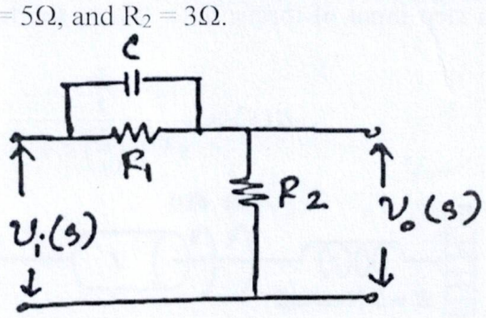

Fig. 1(b)

(c) A plot of G(jw) is superimposed on a Nichols chart in Fig. 1(c). Draw the approximate frequency response showing both magnitude and phase responses. Also determine the gain crossover point, phase margin and gain margin. **5**

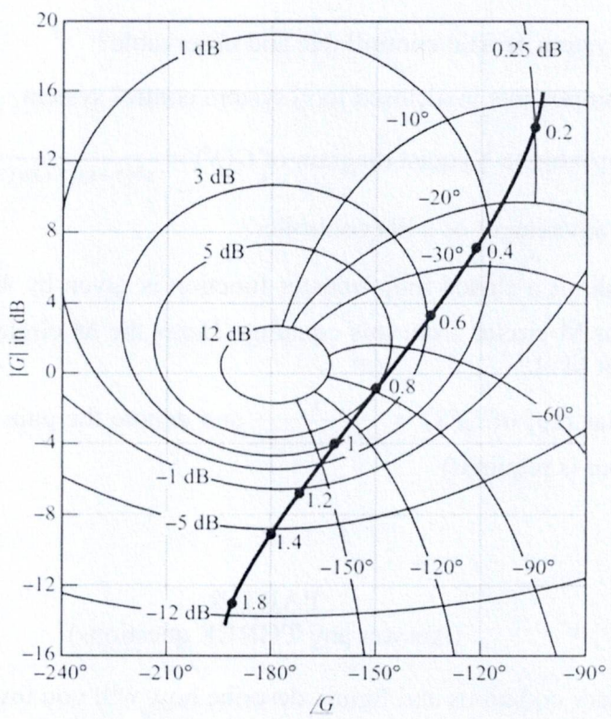

Fig. 1(c)

2. **(a)** State Nyquist stability criterion. Fig. 2(a) shows some points of contour in S-plane. Draw the conformal mapping for contour $F(S) = \frac{S}{S+2}$. Comment on both the mappings based on Cauchy's principle of argument theorem. **2**

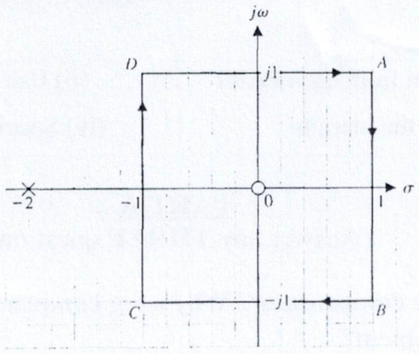

Fig. 2(a)

(b) Given the system shown in Fig. 2(b), find J and D to yield 20% overshoot and a settling time of 2 seconds for a step input of torque T(t). Where the transfer function for the system is given by: **3**

$$G(S) = \frac{\frac{1}{J}}{s^2 + \left(\frac{D}{J}\right)s + \frac{K}{J}}$$

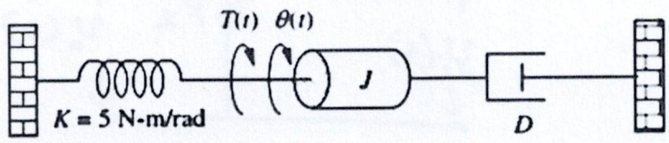

Fig. 2(b)

(c) Define the bandwidth of a system. Two transfer function $T_1(S) = \frac{100}{s^2+10s+100}$ and $T_2(S) = \frac{900}{s^2+30s+900}$ are given. Show that using both transfer functions, the system with a larger bandwidth provides a faster response, even if you have the same damping ratio and overshoot. **5**

3. **(a)** When can a system be said controllable and observable? **2**

(b) Name four components in a closed loop system control system. **3**

(c) Draw the approximate Nyquist diagram of $G(S) = \frac{1}{s^2(1+s)(1+2s)}$ **5**

4. **(a)** What are the advantages of a PD controller? **2**

(b) The magnitude of a closed loop transfer function is given by $M(w) = \left|\frac{u+jv}{1+u+jv}\right|$. Derive an expression for M circles from this equation. Draw the M circles for M<1 and M>1. What happens when M=1? **3**

(c) Draw the polar plot of $G(S) = \frac{1}{s(1+s)(1+2s)}$ and denote the gain margin and phase margins. (A graph paper is required) **5**

PART-B

(Answer any **THREE** questions)

5. **(a)** Using necessary equations and figure, describe how will you investigate additional poles in a second order system. Based on your investigation explain Fig. 5(a) **4**

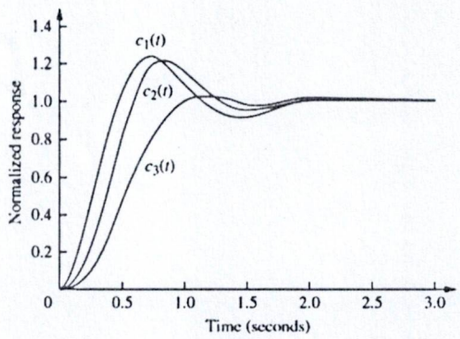

Fig. 5(a)

(b) Given the system represented in the state space by the following equations: **6**

$$\dot{x} = \begin{bmatrix} 0 & 2 \\ -3 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} e^t$$

$$y = \begin{bmatrix} 1 & 3 \end{bmatrix} x$$

$$x(0) = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

Do the following:

i. Solve for y(t) using state-space and Laplace transform technique.

ii. Find the eigenvalues and system poles.

6. **(a)** Prove that the rise time of a first order system is $\frac{2.2}{a}$. (where the symbols have their usual meaning) **4**

(b) Draw the approximate root locus of a feedback system whose open loop transfer function is given by: **6**

$$G(S)H(S) = \frac{k}{s(s+2)(s+3)}$$

7. **(a)** Find the number of poles at right half plane for characteristics equation $P(S) = s^6 + s^5 + 5s^4 + 3s^3 + 2s^2 - 4s - 8$ using Routh table. **4**

(b) Write down the advantage of a PID controller. Find the transfer function *C(S)/R(S)* for the signal flow graph in Fig. 7(b). **6**

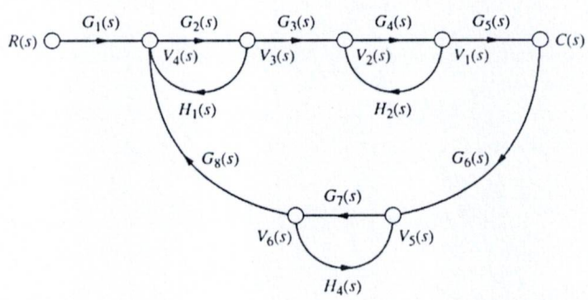

Fig. 7(b)

8. **(a)** Find the time domain response *f(t)* for $F(S) = \frac{3}{s(s^2+2s+5)}$. **4**

(b) What is type number in control systems? Find the steady error for Type-0,1 and 2 system for a unit parabolic signal. **6**