Question Paper Code	13881

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025
Third Semester

Mechanical and Automation Engineering
20EIPC304 - BASIC ELECTRONICS AND CONTROL SYSTEM
Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K-Level	CO
1.	Which of the following materials is most commonly used in semiconductor devices?	1	K1	CO1
	(a) Copper (b) Silicon (c) Iron (d) Silver			
2.	In an NPN transistor, current flows from:	1	K1	CO1
	(a) Emitter to Collector (b) Collector to Emitter			
	(c) Base to Collector (d) Collector to Base			
3.	The output of an inverting amplifier is:	1	K1	CO2
	(a) In phase with input (b) Out of phase by 90°			
	(c) Out of phase by 180° (d) Random phase			
4.	A Wien Bridge Oscillator is based on which type of feedback network?	1	K1	CO2
	(a) RC bridge (b) LC tank circuit (c) Transformer coupling (d) Crystal			
5.	The purpose of signal conditioning is to:	1	K1	CO3
	(a) Generate signals (b) Modify signals for proper processing			
	(c) Filter digital data (d) Convert DC to AC			
6.	The sample and hold circuit is used to:	1	K1	CO3
	(a) Smoothen DC voltage			
	(b) Maintain a constant output voltage for a given time			
	(c) Convert analog to digital			
	(d) Amplify small signals			
7.	A control system in which output has no effect on the control action is called a:	1	K1	CO4
	(a) Closed-loop system (b) Open-loop system			
	(c) Feedback system (d) Regenerative system			
8.	In a mechanical translational system, the analogy of electrical current is:	1	K1	CO4
	(a) Force (b) Velocity (c) Displacement (d) Spring			
9.	The time response of a control system consists of:	1	K1	CO5
	(a) Only transient response (b) Only steady-state response			
	(c) Transient and steady-state responses (d) Frequency response only			
10.	The damping ratio of a second-order system determines:	1	K1	CO5
	(a) Final value (b) Type of transient response (c) Static error (d) Bandwidth			

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K-Level	CO
11.	Define intrinsic and extrinsic semiconductors.	2	K1	CO1
12.	What are the advantages of MOSFET over JFET?	2	K1	CO1
13.	Write the voltage gain expression for an inverting amplifier.	2	K1	CO2
14.	State Barkhausen criterion for sustained oscillations.	2	K1	CO2
15.	Illustrate the meaning of impedance matching.	2	K2	CO3
16.	State any two applications of ADC.	2	K1	CO3
17.	What are the basic elements of a control system?	2	K1	CO4
18.	Define signal flow graph.	2	K1	CO4

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **13881**

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19. Define Peak time.	2	K1	CO5
20. What are the factors to determine the steady state error?	2	K1	CO5
21. Draw the energy band structure of P- type semiconductor.	2	K1	CO1
22. Define signal level and bias changes.	2	K1	CO3

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23.	a)	With a neat diagram explain the working of a PN junction diode in forward bias and reverse bias and show the effect of temperature on its V-I characteristics.	11	K2	CO1

OR

	b) (i)	Demonstrate the V-I characteristics of Zener diode.	5	K2	CO1
	(ii)	Explain with neat sketch of working and construction of PNP transistor.	6	K2	CO1

24.	a)	Outline the need for an instrumentation amplifier? Give a detailed analysis for the same. Explain about any one industrial application of instrumentation amplifier.	11	K2	CO2

OR

	b)	With a neat circuit diagram, describe the working of a Wien bridgeoscillator. Derive an expression for the resonant frequency and condition for maximum oscillation. Give its advantages and disadvantages.	11	K2	CO2

25.	a)	Apply the concept of successive approximation ADC to a digital voltmeter design. Explain its working, advantages, disadvantages.	11	K3	CO3

OR

	b)	Apply the concept of R/2R ladder DAC to design a digital-to-analog converter for audio signal generation. Explain its working, merits, demerits, and practical usage.	11	K3	CO3

26.	a)	Write the differential equations of the mechanical system shown in fig .and draw the force-voltage and force -current analogous circuit and verify by writing Mesh and Nodal equations.	11	K3	CO4
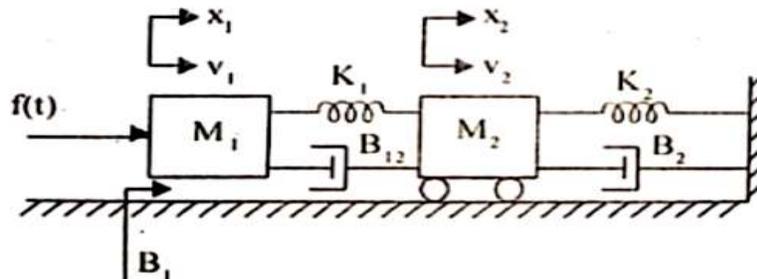
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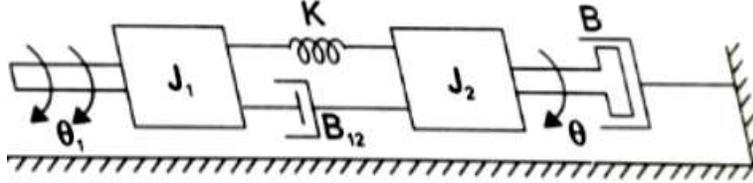|				
	b)	Calculate the overall gain C(s)/R(s) for the signal flow graph shown in fig.	11	K3	CO4
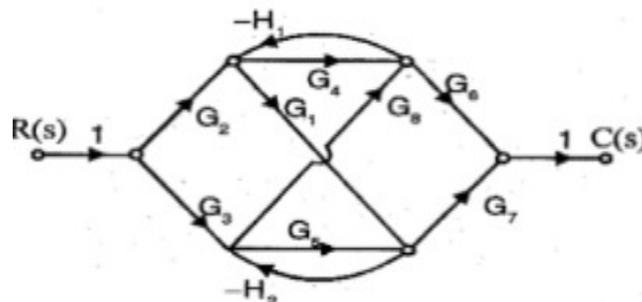
27. a) Derive the expression and draw the response of second order system for under damped case with unit step input. *11 K3 CO5*

OR

b) Derive the expressions for Time domain specifications with unit step input. *11 K3 CO5*

28. a) Find the Transfer Function of the given Mechanical System. *11 K3 CO4*

OR

b) Consider the unity feedback system with a closed loop transfer function *11 K3 CO4*
$C(s)/R(s) = Ks+b/s^2 +as+b$. Determine open loop transfer function $G(s)$. Show that steady state error with unit ramp input is given by $(a-k)/b$.