Reg. No.																

Question Paper Code	13128

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Third Semester

Mechanical and Automation Engineering

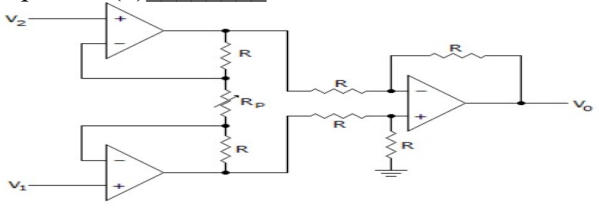
20EIPC304 - BASIC ELECTRONICS AND CONTROL SYSTEMS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The UJT may be used as _____. (a) A amplifier (b) A sawtooth generator (c) A rectifier (d) None of the above	1	K1	CO1
2.	The "latching current" in an SCR refers to ____. (a) The current at which the device turns off (b) The current at which the device turns on (c) The maximum current that the device can handle (d) The minimum current that the device can handle	1	K2	CO1
3.	What does MOSFET stands for? (a) Metal Oxide Semiconductor Field Effect Transistor (b) Modern Oxidized Silicon based Field Effect Transistor (c) Modern Oxidized Silicon based Force Effect Transistor (d) Metal Oxide silicon Field Equivalent Transistor	1	K2	CO1
4.	SCR is abbreviated as _____ (a) Silicon controlled rectifier (b) Silicon conducting rectifier (c) Silicon-controlled resistor (d) None of the above	1	K1	CO1
5.	The circuit in which the output voltage waveform is the integral of the input voltage waveform is called (a) Integrator (b) Differentiator (c) Phase shift oscillator (d) Square wave generator	1	K1	CO2
6.	This circuit is an example of a(n)_____.  (a) dc voltmeter (b) display driver (c) instrumentation amplifier (d) None of the above	1	K2	CO2
7.	A class A power amplifier uses _____ transistor(s). (a) 2 (b) 1 (c) 3 (d) 4	1	K2	CO2
8.	Both negative and positive feedback is present in _____ oscillator. (a) RC phase shift oscillator (b) Wien bridge oscillator (c) Twin T oscillators (d) Crystal oscillator	1	K1	CO2
9.	How many control lines are present in analog to digital converter in addition to reference voltage? (a) Three (b) Two (c) One (d) None of the mentioned	1	K1	CO3
10.	The order of output resistance of 741 OPAMP is, (a) 0.1 Ω to 10 Ω (b) 10 Ω to 105 kΩ (c) 10 ×103 Ω to 109 Ω (d) 103 Ω to 106 Ω.	1	K2	CO3
11.	Find out the resolution of 8 bit DAC/ADC? (a) 562 (b) 625 (c) 256 (d) 265	1	K1	CO3

12.	Express the output voltage of digital to analog converter? (a) Vo =KVFS(d12-1+d22-2+….dn2-n) (b) Vo =VFS/k(d12-1+d22-2+….dn2-n) (c) Vo =VFS(d12-1+d22-2+….dn2-n) (d) Vo =K(d12-1+d22-2+….dn2-n)	*1*	*K2*	*CO3*
13.	In control system block diagrams, which mathematical operation is performed at summing points? (a) Addition or subtraction (b) Multiplication (c) Integration (d)Differentiation	*1*	*K2*	*CO4*
14.	In Mason's Gain Formula, what is meant by a "non-touching loop"? (a) Two loops that share a node (b) Two loops that do not share any common nodes (c) Two loops that share a branch (d) Two loops with the same gain	*1*	*K2*	*CO4*
15.	In a mechanical rotational system, which of the following is analogous to electrical resistance? (a) Moment of inertia (b) Damping coefficient (c) Angular displacement (d) Stiffness	*1*	*K1*	*CO4*
16.	The transfer function of a system is defined as the ratio of the: (a) Output response to the input disturbance (b) Laplace transform of the output to the Laplace transform of the input (c) Input to the feedback element (d) Output to the summing junction	*1*	*K1*	*CO4*
17.	Which of the following is NOT a standard test signal used in control systems? (a) Unit Step (b) Unit Impulse (c) Sine Wave (d) Triangular Wave	*1*	*K2*	*CO5*
18.	In a second-order under damped system, the overshoot depends on: (a) The natural frequency only (b) The damping ratio only (c) Both the natural frequency and damping ratio (d) None of the above	*1*	*K1*	*CO5*
19.	The time required for the response to reach and stay within a specified percentage of its final value is: (a) Peak time (b) Delay time (c) Settling time (d) Rise time	*1*	*K1*	*CO5*
20.	If the damping ratio (ζ) of a second-order system is less than 1, the system is: (a) Underdamped (b) Critically damped (c) Overdamped (d) Undamped	*1*	*K1*	*CO5*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

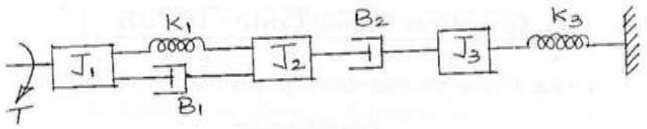
21.	Define Knee Voltage of a diode.	*2*	*K1*	*CO1*
22.	Draw the symbol and VI characteristics of SCR.	*2*	*K2*	*CO1*
23.	Define CMRR of an op-amp.	*2*	*K1*	*CO2*
24.	Mention the Classifications of Oscillators.	*2*	*K1*	*CO2*
25.	Justify the purpose of a filter in analog circuits.	*2*	*K1*	*CO3*
26.	List out the main applications of DACs in electronic systems.	*2*	*K1*	*CO3*
27.	What is block diagram? Mention the basic components of block diagram.	*2*	*K2*	*CO4*
28.	Formulate the force balance equation for mass, ideal dash pot and ideal spring element.	*2*	*K2*	*CO4*
29.	State poles and zeros of the system.	*2*	*K2*	*CO5*
30.	Define damping ratio and how the system is classified on the value of damping.	*2*	*K1*	*CO5*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a) i)	Describe the working, operation and characteristics of N- channel JFET with neat sketch.	*5*	*K2*	*CO1*
	ii)	Discuss the working, operation and characteristics of Depletion MOSFET.	*5*	*K2*	*CO1*
		OR			
	b)	Demonstrate the working, operation and characteristics of UJT with relevant diagrams.	*10*	*K2*	*CO1*
32.	a)	Explain Integrator with neat sketch.	*10*	*K2*	*CO2*
		OR			

	b)	With a neat diagram explain about Hartley oscillator & derive the expression for frequency of oscillation and condition of oscillation.	*10*	*K2*	*CO2*
33.	a)	Describe the design and operation of a peak detector circuit. Explain its applications in signal processing and instrumentation, and how its performance can be optimized.	*10*	*K2*	*CO3*
		OR			
	b)	Explain the operation of Successive Approximation type ADC.Discuss their design, advantages, disadvantages, and how they are used in practical applications.	*10*	*K2*	*CO3*
34.	a)	Write the differential equations governing the mechanical rotational system shown in figure. Draw the torque-voltage and torque-current electrical analogous circuits and verify by writing mesh and node equations.	*10*	*K3*	*CO4*



OR

	b)	Calculate the overall gain C(s)/R(s) for the signal flow graph shown in fig.1	*10*	*K3*	*CO4*

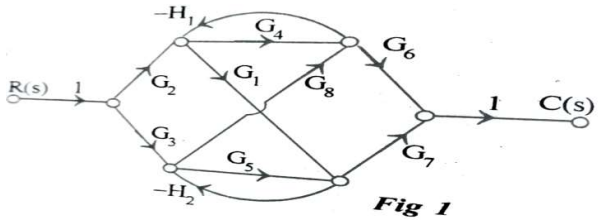
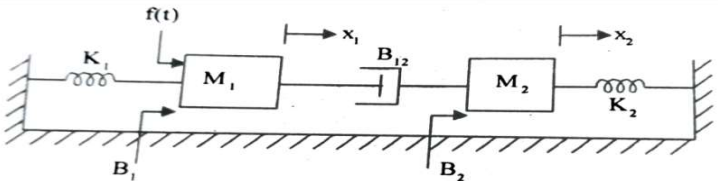


Fig 1

35.	a)	Derive the expressions for Time domain specifications with unit step input.	*10*	*K2*	*CO5*
		OR			
	b)	The unity feedback system is characterized by an open loop transfer function G(s)= K/s(s+10). Determine the gain K, so that the system will have a damping ratio of 0.5 for this value of K. Determine settling time, peak overshoot and peak time for a unit step input.	*10*	*K2*	*CO5*
36.	a)	Compute the differential equations governing the mechanical system shown in fig. and determine the transfer function.	*10*	*K3*	*CO4*



OR

	b)	Derive the expression and draw the response of second order system for critically damped case with unit step input.	*10*	*K2*	*CO5*