Reg. No.															

Question Paper Code	13463

B.E. / B.Tech. - DEGREE EXAMINATIONS, APR / MAY 2025

Third Semester

Mechanical and Automation Engineering

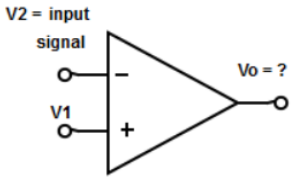
20EIPC304 - BASIC ELECTRONICS AND CONTROL SYSTEMS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	A transistor has how many pn junctions? (a) 1 (b) 2 (c) 3 (d) 4	1	K1	CO1
2.	The Silicon Controlled Rectifier (SCR) is a ____ device. (a) Unidirectional (b) Bidirectional (c) Tridirectional (d) Multidirectional	1	K1	CO1
3.	Determine the output from the following circuit  (a) 180º in phase with input signal (b) 180º out phase with input signal (c) Same as that of input signal (d) Output signal cannot be determined	1	K2	CO2
3.	Which is not the internal circuit of operational amplifier? (a) Differential amplifier (b) Level translator (c) Output driver (d) Clamper	1	K1	CO2
5.	When using a.c signal conditioning system for capacitive transducers , the carrier frequencies, (a) Range between 50 Hz an 20 kHz (b) Should be of the order of 0.5 MHz (c) Should be of the order of 20MHz (d) None of the above.	1	K1	CO3
6.	An a.c signal conditioning system is normally used for (a) Resistive transducers like strain gauges (b) Inductive and capacitive transducers (c) Piezoelectric transducers (d) All of the above.	1	K1	CO3
7.	If a block diagram contains two cascaded blocks with transfer functions G1(s) and G2(s), how can these blocks be combined into a single block? (a) Add the transfer functions (b) Multiply the transfer functions (c) Subtract the transfer functions (d) Divide the transfer functions	1	K1	CO4
8.	What is the name of the formula used to find the overall transfer function of a system from its signal flow graph? (a) Mason's Gain Formula (b) Routh-Hurwitz Criterion (c) Nyquist Criterion (d) Root Locus Method	1	K1	CO4
9.	The following condition is used for representing _____ F(t) = At; for t > 0 F(t) = 0; for t<0 (a) Step function (b) Ramp function (c) Parabolic function (d) Impulse function	1	K1	CO5
10.	What is the term used for the time taken by the system output to reach 50% of the final value for the first time? (a) Rise time (b) Settling time (c) Delay time (d) Peak time	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Differentiate between intrinsic and extrinsic semiconductor.	*2*	*K2*	*CO1*
12.	Draw the V-I characteristics of PN junction diode.	*2*	*K1*	*CO1*
13.	Draw the symbol and structure of UJT.	*2*	*K1*	*CO1*
14.	Define an operational amplifier.	*2*	*K1*	*CO2*
15.	Why IC 741 is not used for high frequency applications?	*2*	*K1*	*CO2*
16.	Mention the characteristics of a practical op-amp.	*2*	*K1*	*CO2*
17.	List the standard analog signals?	*2*	*K1*	*CO3*
18.	State the principle Successive Approximation ADC?	*2*	*K1*	*CO3*
19.	Distinguish between open loop and closed loop system.	*2*	*K2*	*CO4*
20.	Define Transfer function.	*2*	*K1*	*CO4*
21.	Name the test signals used in control system.	*2*	*K1*	*CO5*
22.	Distinguish between type and order of a system.	*2*	*K2*	*CO5*

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)	Explain the V-I characteristics of Zener diode.	*6*	*K2*	*CO1*
	(ii)	Discuss with neat sketch the working and construction of PNP transistor.	*5*	*K2*	*CO1*
24.	a)	Describe the operation of Instrumentation amplifier with neat sketch.	*11*	*K2*	*CO2*
		OR			
	b)	Explain Wein Bridge oscillator with neat sketch and derive its frequency conditions.	*11*	*K2*	*CO2*
25.	a)	Demonstrate the working principle, design considerations, and applications of a sample and hold circuit and how it plays a critical role in analog-to-digital conversion processes.	*11*	*K2*	*CO3*
		OR			
	b)	Explain the operation of R/2R Ladder type DAC. Discuss their design, advantages, disadvantages, and how they are used in practical applications.	*11*	*K2*	*CO3*
26.	a)	Write the differential equations of the mechanical system shown in fig .1 and draw the force-voltage & force -current analogous circuit and verify by writing Mesh and Nodal equations.	*11*	*K2*	*CO4*

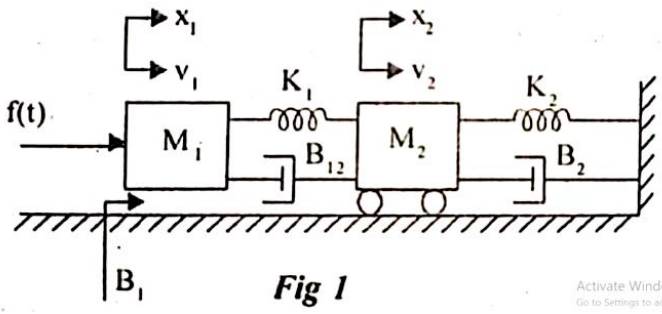
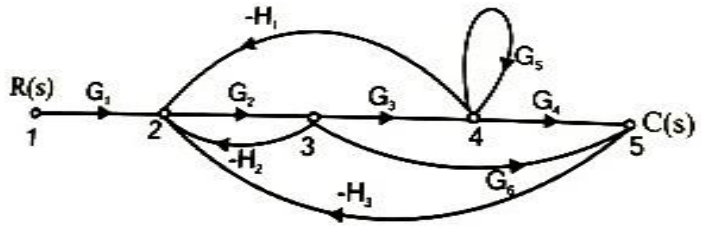


Fig 1

OR

b) Find the overall gain C(s) / R(s) for the signal flow graph shown below. *11 K2 CO4*

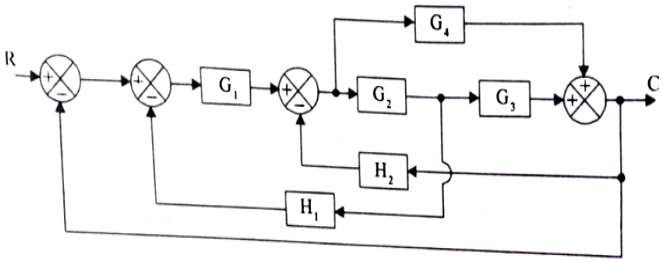


27. a) Derive the expression and draw the response of under damped second order system for unit step input. *11 K3 CO5*

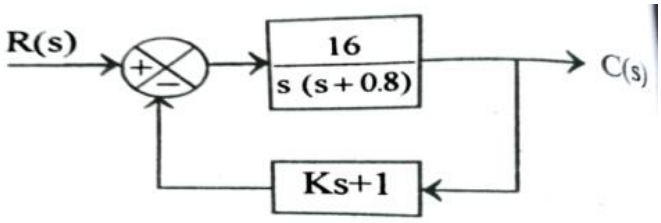
OR

b) Consider the unity feedback system with a closed loop transfer function $C(s)/R(s) = Ks+b/s^2+as+b$. Determine open loop transfer function G(s). Show that steady state error with unit ramp input is given by (a-k)/b. *11 K3 CO5*

28. a) (i) Obtain the closed loop transfer function C(S) / R(S) using block diagram reduction techniques. *6 K2 CO4*

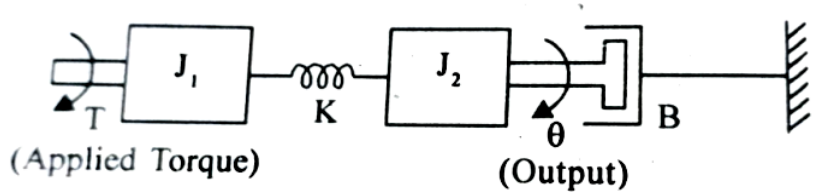


(ii) A positional control system with velocity feedback is shown in fig. What is the response of the system for unit step input. Given that $\zeta = 0.5$. Also calculate rise time, peak time, maximum overshoot and settling time. *5 K3 CO5*



OR

b (i) Compute the differential equations governing the mechanical system shown in fig. and determine the transfer function. *6 K2 CO4*



(ii) Obtain the response of unity feedback system whose open loop transfer function is G(s)= 4/s(s+5) and when the input is unit step. *5 K3 CO5*