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23171  
ANSWER KEY

Questions should be —  
WRITTEN IN LEGIBLE HANDWRITING IN BLACK INK.  
SIGNS, SKETCHES OR FIGURES IF ANY BE DRAWN IN NEAT BLACK INK,  
so as to avoid mistakes in the printed question papers.

Duration ..... Hours

Total Marks assigned to the paper .....

Marks

Q. No.

N.B.:

$$Q1. a) \frac{E_o(s)}{E_i(s)} = \frac{1+SCR_2}{HSC[R_1+R_2]}$$

b) Diag [2]

Explanation [3]

c) five factors and one line explanation of each.

d) No sign change, stable.

s <sup>4</sup>	36	50
s <sup>3</sup>	6	56
s <sup>2</sup>	16.6	50
s <sup>1</sup>	0.7	21
s <sup>0</sup>		0

Q2. a) Number of forward paths = k = 1

$$\Delta F = \frac{T_1 \Delta_1}{\Delta}$$

$$T_1 = G_1 G_2 G_3 G_4, \quad L_1 = -G_4 H_1, \quad L_2 = -G_3 H_4$$

$$L_3 = -G_4 H_3, \quad L_4 = -G_2 G_3 G_4 H_2$$

$$\frac{CCS}{RCS} = \frac{G_1 G_2 G_3 G_4}{1 + G_1 H_1 + G_2 H_4 + G_4 H_3 + G_2 G_3 G_4 H_2 + G_5 + G_1 G_2 H_1 H_4 + G_1 G_4 H_3 H_3 - G_1 H_1 G_5 - G_3 G_5 H_4 - G_1 G_3 G_5 H_1 H_4}$$

(Q2)

Q. No.	Page No.	Marks
Q2	23171	4
Q3		
a)	Block diagram of function generator in detail [4] Explanation, Working [6]	
b)	Block diagram, explanation (working) [10]	
	$\frac{C(s)}{R(s)} = \frac{G_1 G_2 G_3}{1 - G_1 G_2 H_1 + G_2 G_3 H_2 + G_1 G_2 G_3}$	
Q4		
a)	$\theta_1 = 60^\circ, \theta_2 = 180^\circ, \theta_3 = 300^\circ$ $\sigma = -2$ $k_{mr} = 48, S = \pm j 2.328$ Breakaway $S = -0.845, k = 3.0979$	
b)	With proper diagram, Bode's plot explanation for frequency and phase measurement.	
Q5		
a)	$\omega_{gc} = 2.1 \text{ rad/sec}, G_m = 21 \text{ dB}$ $\omega_{pc} = 6.35 \text{ rad/sec}, P_m = 38^\circ$ System stable	
Q6		
a)	Digram [03], Explanation [07]	
b)	$\theta = 0.9272 \text{ radians}$ $\omega_d = 4 \text{ rad/sec}$ $T_r = 0.5535 \text{ sec}, T_p = 0.784 \text{ sec}$ $\%MP = 9.48\%, T_s = 1.33 \text{ sec}$	

ANSWER  
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