E/ETRX, INST, EXTC/CBSGS/AM-IV/MAY 2017

Q.P. Code : 11837

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question.No.1 is compulsory.
2. Attempt any three from the remaining.

Q.1. a) Find the extremal of $\int_{x_0}^{x_1} \frac{1+y^2}{y'^2} dx$ **(5)**

b) Is $(6,7,-4)$ a linear combination of $v_1 = (1,2,2), v_2 = (3,4,6)$ **(5)**

c) Check whether $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$ is derogatory or not. **(5)**

d) Evaluate $\int_0^{1+i} z^2 dz$, along the parabola $x = y^2$ **(5)**

Q.2. a) Show that the functional $\int_0^{\pi/2} \left\{ 2xy + \left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 \right\} dt$; such that $x(0) = 0, x\left(\frac{\pi}{2}\right) = -1,$

$y(0) = 0, y\left(\frac{\pi}{2}\right) = 1$ is stationary if x=-sint, y=sint. **(6)**

b) Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+a^2)(x^2+b^2)} dx, a > 0, b > 0$ **(6)**

c) Reduce the quadratic form $x^2 - 2y^2 + 10z^2 - 10xy + 4xz - 2zy$ to canonical form and hence, find its rank, index and signature and value class. **(8)**

Q.3. a) Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence find A^{-1} & A^4 **(6)**

b) Using Residue theorem evaluate $\int_C \frac{e^z}{z^2 + \pi^2} dz$ where C is |z|=4. **(6)**

c) Find the singular value decomposition of $\begin{bmatrix} 2 & 3 \\ 0 & 2 \end{bmatrix}$ **(8)**

Q.4. a) If $A = \begin{bmatrix} -1 & 4 \\ 2 & 1 \end{bmatrix}$, prove that 3tanA=Atan3 **(6)**

b) Find the sum of the residues at singular points of $f(z) = \frac{z-4}{z(z-1)(z-2)}$ **(6)**

c) Check whether the set of real numbers (x,0) with operation $(x_1, 0) + (x_2, 0) = (x_1 + x_2, 0)$, and $k(x_1, 0) = (kx_1, 0)$ is a vector space. (8)

Q.5. a) Find the extremum of $\int_{x_0}^{x_1} (2xy - y''^2)\,dx$. (6)

b) Construct an orthonormal basis of R^3 using Gram Schmidt process to $S = \{(3,0,4),(-1,0,7),(2,9,11)\}$ (6)

c) Find all possible Laurent's expansions of $\dfrac{2z-3}{z^2-4z-3}$ about $z = 4$. (8)

Q.6. a) Find the linear transformation Y=AX which carries $X_1 = (1,1,-1)', X_2 = (1,-1,1)', X_3 = (-1,1,1)'$ onto $Y_1 = (2,1,3)', Y_2 = (2,3,1)', Y_3 = (4,1,3)'$ (6)

b) Show that the vectors $v_1 = (1,2,4), v_2 = (2,-1,3), v_3 = (0,1,2)$ are linearly independent. Express $v_4 = (-3,7,2)$ in terms of v_1, v_2, v_3 (6)

c) If C is circle |z|=1, using the integral $\int_C \dfrac{e^{kz}}{z}\,dz$ where k is real, show that

$\int_0^{\pi} e^{k\cos\theta}\cos(k\sin\theta)\,d\theta = \pi$ (8)

INST / Sem-IV (CBSGS) / Feedback Control System / May-17

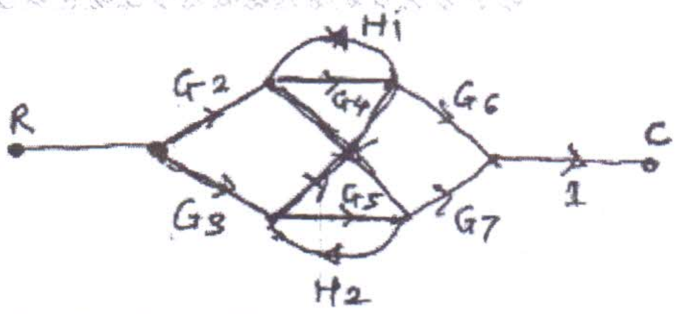
QP Code :551100

(3 Hours) **[Total Marks :80**

N.B. : (1) Question no. **1** is **compulsory.**
(2) Answer any **three** out of the remaining **five** questions.
(3) **Assumptions** made should clearly stated.

1. Attempt any **four** :- **20**
   (a) Compare open loop and closed system.
   (b) Explain principle of superposition and homogeneity.
   (c) Explain regenerative feedback.
   (d) Explain co-rrelation between time and frequency response.
   (e) What is the effect of adding a zero to a system.

2. (a) A unity feedback control system has an open loop transfer function $G(s) = \dfrac{k}{s(s^2+4s+13)}$ sketch the root locus plot of the system. Find the value of k and frequency at which the root loci cross the jw axis. **10**
   (b) Obtain the overall transfer function C/R from the signal flow graph shown in figure. **10**



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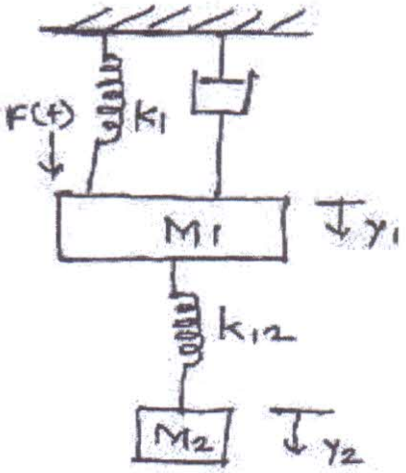
3. (a) Write the differential equations governing the behaviour of mechanical system shown in figure. Also obtain an analogous electrical circuit based on force-current analogy 10



(b) Sketch the Bode plot and determine the gain cross over frequency for the transfer function given below 10

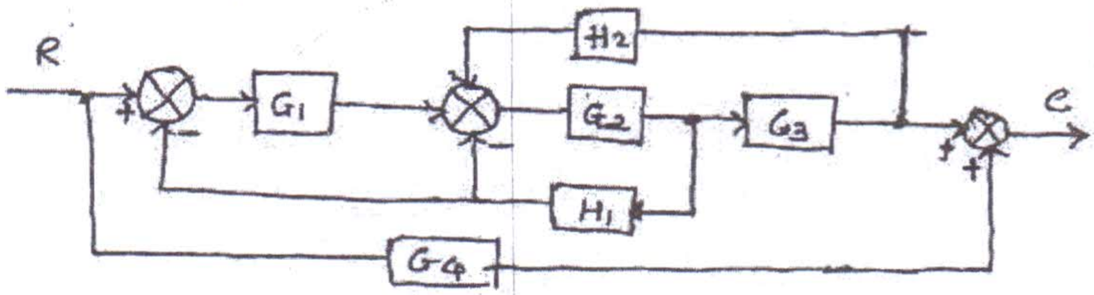
$$G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$$

4. (a) (i) Sketch the polar plot of transfer function given below 5

$$G(s) = \frac{1}{(1+s)(1+2s)}$$

(ii) Explain any one thermal system and also write its difference equation. 5

(b) Using the block diagram reduction techniques find the closed loop transfer function of the system given below 10



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Q. P. Code: 13790

Duration: 3 Hours Total Marks: 80

Note: 1) Question no **1** is compulsory

2) Solve any **three** questions from remaining questions

3) Assume suitable data if required and mentioned it

Q.1 Solve **any four** **20**

a) What is the difference between a generator and a motor?

b) Explain power flow diagram for an Induction Motor

c) State the advantages and disadvantages of moving iron instrument.

d) Explain the applications of CRO

e) *Derive e.m.f equation of DC generator*

Q.2 a) Two series motors run at a speed of 700 r.p.m. and 750 r.p.m respectively, when *taking 70A at 500 V. The terminal* resistance of each motor is 0.5Ω. Calculate the speed of the combination when connected in series and coupled mechanically. The combination is taking 70A at 500V supply. 10

b) Explain speed control methods of DC motor 10

Q.3 a) Explain how rotating magnetic field is produced in 3 phase induction motor. 10

b) Explain the Speed control methods for DC Shunt Motor 10

Q. 4) a) Derive the bridge balance equation for the basic a.c. bridge 10

b) Explain series and shunt type ohm meter 10

Q. 5) a) A 3phase, 12 pole, induction motor has rotor resistance of 0.15Ω and standstill reactance of 0.25Ω per phase . On full Load it is running at a speed of 480 r.p.m. The rotor induced e.m.f. per phase at standstill is observed to be 32V. Calculate 10

i) Starting Torque ii) Full load torque

iii) Maximum Torque iv) Speed at maximum torque.

b) Explain variable frequency drive. List its applications 10

Q.6) Write short notes on (**any two**) 20

1) DMM

2) Shaded pole induction motor

3) Applications of CRO.

Q.P. Code :13502

(Time: 3 Hours) **[Total Marks : 80]**

Please check whether you have got the right question paper.

N.B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **three** questions from the remaining questions.

(3) Assume **suitable** data if **necessary**.

1. Attempt any **four**:- **20**

(a) Explain Pre-emphasis and De-emphasis.

(b) Compare the SSB and VSB techniques.

(c) Calculate the maximum bandwidth requirement for FM broadcast if the maximum deviation allowed is 75 kHz and the maximum modulation frequency allowed is 15 KHz.

(d) Write note on PAM telemetry system.

(e) Explain OSI reference model.

2. (a) Explain in brief :- **10**

(i) Frequency Shift Keying (FSK)

(ii) Quaternary Phase Shift Keying (QPSK)

(b) An Amplitude modulated waveform has the form: **10**

$X_c(t) = [10\ (1 + 0.6 \cos 2000\,\pi t + 0.6 \cos 4000\,\pi t)\cos 20{,}000\,\pi t]$

i) Sketch the amplitude spectrum of Xc(t).

ii) Find the power content of each spectral component including the carrier.

iii) What is the modulation index ?

iv) Find the power carried by the sidebands and total power.

3. (a) Define and describe pulse position modulation. Explain with waveforms how it is derived from PWM. **10**

(b) Explain the various communication modes as simplex, half duplex and duplex in detail. **10**

4. (a) Draw the ASK,BPSK,QPSK and BPSK waveforms for digital data 101001011. **10**

(b) (i) Draw the circuit diagram of a Foster Seeley phase discriminator and explain its principle of operation with phasor diagram. **08**

(ii) Is it required to transmit the complex modulating signal in which the highest frequency component is 4 KHz. Compare the bandwidth required for AM, SSB and FM. Given that the maximum frequency deviation is 16 KHz. **02**

5. (a) Draw the block diagram of Linear Delta Modulation system (transmitter and receiver) and explain the working with a suitable waveform. Also explain slope-overload error. What is the maximum slope of the input signal, the system can handle without distortion ? **10**

(b) With the help of neat sketches explain voltage, current and position telemetry Systems. **10**

6. Write Short notes on any **four**: - **20**
(a) SSB modulation
(b) Multiplexing techniques
(c) FM Noise Triangle
(d) Feedback Telemetry
(e) GPIB Bus

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Sem-IV (CBSGS) / INST / T1724 / T1052 TRANSDUCERS II / MAY-2017

Q.P. Code :13547

[Time: Three Hours] **[Marks:80]**

N.B:
1. Question.No.1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Assume suitable data wherever necessary.

Attempt any four . 20

a Explain electrodes used for PH measurement.

b State the working principle of elastic type pressure sensors also draws its neat sketches.

c Compare orifice and venturi meter.

d Explain various energy losses in pipes.

e Derive the expression for gauge factor of strain gauge.

a Draw and explain pressure measurement scheme using bourdon tube and LVDT. 10

b State and derive Bernoullis equation. 10

a Explain in details sutaible instrument used for calibration of pressure gauges. 10

b What is ORP ? Explain setup used for ORP measurement. 10

a A strain gauge bonded to a steel beam 0.1 m long and has a crossectional area 4 cm^2.Young's modulus for steel is 207 GN/m^2.The strain gauge has an unstrained resistance of 240Ω and gauge factor of 2.2.When a load is applied,the resistance of gauges changes by 0.013Ω.Calculate the change in length of the steel beam and an amount of force applied to the beam. 10

b Explain with diagram working of Mcleod Gauge 10

a Classify flow measurement techniques .Explain the construction and working of electromagnetic flow meter. 10

b Explain the need of temperature compensation for strain gauge and state applications of strain gauge. 10

Write a short note on :- 20

a Viscosity measurement

b Dynamometer

c Torque measurement
