BE(E) VII (R)
COMMUNICATION ENGG.

Con. 2947-09. VR-4707

(3 Hours) Page 1 [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Figures to the **right** indicate **full** marks.
(4) Make **suitable** assumptions wherever **necessary**.

1. (a) State and explain Shanon-Hartely Theorem. 5
(b) Explain eye pattern with a neat sketch. 5
(c) State and explain Keppler's laws. 5
(d) Explain the terms, 'Cell Splitting' and 'frequency reuse'. 5

2. (a) Draw and explain orthogonal QPSK transmitter and receiver. 10
(b) Draw the block diagram of a satellite earth station and explain the working. 10

3. (a) Compare the following :— 10
(i) ISI and ICI
(ii) Systematic and Non-systematic Codes
(b) State and prove the Sampling Theorem for low pass signal. 10

4. (a) Explain the following terms :— 10
(i) Entropy
(ii) Information rate
(iii) Channel Capacity
(b) Consider a telegraph source having two symbols dot and dash. The dot duration is 0·2 sec. and the dash duration is 3 times the dot duration. The probability of dots occuring is twice that of dash and time between symbols is 0·2 seconds. Calculate information rate of the telegraph source. 10

5. (a) Explain Syndrome decoding for Cyclic codes. 10
(b) Find out the generator matrix for a systematic (7, 4) cyclic code, if 10
$G(p) = p^3 + p + 1$
Also find the parity check matrix.

6. (a) Explain the various losses that occur in optical fibers. 10
(b) Explain the working of a 2 Cavity Klytron with the help of a neat sketch. 10

7. Write short notes on any **three** :— 20
(a) Duobinary encoder
(b) MTSO
(c) PIN Photodiode
(d) Station Keeping.

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BE(E) VII (R)
HVDC TRANSMISSION

Con. 2902–09. VR–4710

(3 Hours) Page (1). [Total Marks : 100

Lib 4/6/19

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **suitable** data, if **required**.

B.E (E) VII Rev HVDC Transmission 4/6/09.

1. (a) Operation of the bridge converter with overlap angle in the range between 60° and 120° is abnormal. Justify the statement. 20
(b) For a bridge converter with grid control and with overlap less than 60° MASTER

Prove that $\text{Cos}\,\phi \cong \text{Cos}\,\alpha - \frac{R_c I_d}{V_{do}}$

(c) Explain the importance of current margin.
(d) Explain with neat diagram 'Mode Stabilization'.

2. (a) Explain with neat diagram the components of HVDC Transmission System. 10
(b) Explain with neat waveforms single commutation failure. 10

3. (a) Derive the steady state equivalent circuit of HVDC converter. 12
(b) 'Converter consumes reactive power'— Justify the statement. 8

4. (a) Explain with neat waveforms of voltage and currents, the commutation from a normally operating rectifier bridge to the by pass valve. 10
(b) Describe with neat diagram different filters used in HVDC Transmission System. 10

5. (a) Explain the problem caused while connecting a weak AC System to a DC System. How it can be eliminated ? 10
(b) Explain equidistant pulse control schemes used in HVDC valves. What are its advantages ? 10

6. (a) Explain power reversal in HVDC system with control characteristics. 10
(b) Explain with neat diagram and waveforms the principle of 12 pulse converter. 10

7. Write short notes on any **two** :— 20
(a) Causes and effect of Harmonics
(b) Starting and stopping of a DC link
(c) Recent trends in HVDC.

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BE(E) sem VII (Rev)
Control Sys - II

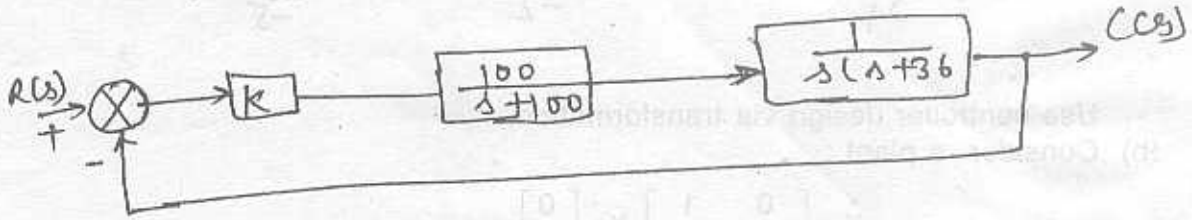
Con. 3253-09. VR-4704

(3 Hours) [Total Marks : 100

N.B.: (1) Question No. 1 is **compulsory.**
(2) Attempt **five** questions **only.**
(3) Make any **suitable** assumption wherever **required.**

1. (a) Explain different type of controller configuration. 5
(b) Derive the transfer function from state space equation. 5
(c) Explain the advantages of state space design method. 5
(d) Explain controllability and observability. 5

2. For the system given below : 20



Use bode diagram to design a lag compensator to yield a ten fold improvement in steady state error over the gain compensated system while keeping the percent overshoot at 9·5%.

3. (a) Consider a unity feedback control system whose feedforward transfer function is given by $G(s) = \frac{15}{s(s+3)(s+9)}$. 15

Design a compensator such that the dominant closed loop poles are located at $-2 \pm j2\sqrt{3}$ and $K_v = 80\ sec^{-1}$. Use root locus method.

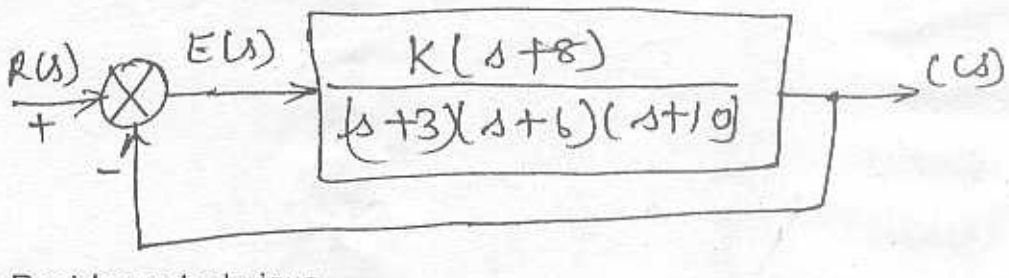
(b) What is estimator ? Explain its need in control system. 5

4. Given the transfer function of a system— 20

$$\frac{Y(s)}{U(s)} = \frac{2s^2 + 6s + 5}{(s+1)^2(s+2)}$$

Draw its phase variable form, controller form, observer form and parallel form representation in state space.

5. Design a PID controller for system given so that the system can operate with a peak time that is two-third of the uncompensated system at 20% overshoot and with zero steady state error for step input. 20



Use Root locus technique.

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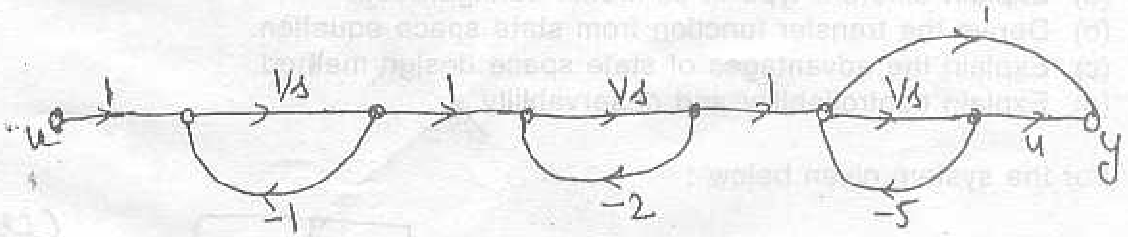
6. (a) Design a state variable feedback controller to yield 20% overshoot and a settling time of 5 sec for a plant. **15**

$$G(s) = \frac{s+4}{(s+1)(s+2)(s+5)}$$

represented in cascade form



Use controller design via transformation.

(b) Consider a plant : **5**

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$Y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

Design a integral controller to yield a 12% overshoot and settling time of 0·6 sec.

7. Write short notes on any **four** :— **20**

(a) Stability in digital control
(b) Rate feedback control system
(c) Sample and Hold circuit
(d) PID controller
(e) Anti-alias prefilter
(f) Random effect.

BE(E) Sem VII (R)

Protection & Switchgear Engg.

Con. 2985–09. VR–4698

(3 Hours) [Total Marks : 100

Page (1)

MASTER

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of **remaining six** questions.
(3) Assume **suitable** data and justify **clearly**.

1. (a) Discuss various parameters of protective relaying. 10
   (b) Explain the following terms :— 10
   (i) Arc extinction in A.C. circuit and D.C. circuit.
   (ii) Making and Breaking capacity of circuit breaker.

2. (a) Explain the constructional details of HRC fuse. How arc is extinguished in HRC fuse ? State advantages of HRC fuse. 12
   (b) Explain over-reach and under-reach in impedance relay and state the measure to overcome it. 8

3. (a) Explain the construction and working principle of an induction type over current relay. Derive torque equation for it. 10
   (b) A 3 phase, 2 pole, 11 K.V., 10,000 KVA alternator has neutral earthed through a resistance of 7 ohms. The machine has current balance protection which operates upon out of balance current exceed 20% of full load. Determine % of winding protected against earth fault. 10

4. (a) Explain in detail construction and working principle of vaccum circuit breaker. 10
   (b) Explain the phenomenon of current chopping, its effects and measures taken to reduce it, in the circuit breaker. 10

5. (a) Draw and explain three step distance relaying scheme for protection of transmission line. 10
   (b) In a system the rms voltage is 19·1 kV, L is 10 mH, C is 0·02 μF. Determine the average rate of rise of restriking voltage when the circuit breaker opens. 10

6. (a) Draw a schematic for motor protection against single phasing and explain its working in detail. 10
   (b) Draw and explain the construction and working of the Buchholz Relay used for transformer protection. 10

7. Write short notes on any **three** :— 20
   (a) Static and electromagnetic relays
   (b) Construction and working of SF_6 circuit breaker.
   (c) Resistance Switching
   (d) Amplitude and phase comparators.

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BE(E) VII (Rev)

Lib Con. 2779-09. Comp. Aided Power Syst. Analysis VR-4702

(3 Hours) [Total Marks : 100

Page (1)

MASTER

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining.
(3) Assume **suitable** data if **required**.

1. (a) Derive the expression for transmission loss using B-coefficients. 10
   (b) Two generating units are operating in parallel. Incremental fuel costs in Rs/Mwh for the two units are 10

$$dc_1/dPG_1 = 0{\cdot}20\ PG_1 + 40;\ 30\ Mw \leq PG_1 \leq 175\ Mw.$$
$$dc_2/dPG_2 = 0{\cdot}40\ PG_2 + 30;\ 20\ Mw \leq PG_2 \leq 125\ Mw.$$

   How the load is shared among two units as system load varies from minimum to maximum ? What is the corresponding incremental fuel cost?

2. (a) Explain the speed governing system used for automatic load frequency control and hence derive the transfer function for the same. 10
   (b) Two generators rated 200 Mw and 400 Mw are operating in parallel. The droop characteristics of their governers are 4% and 5% respectively from no load to full load. Assuming that generators are operating at 50 Hz at no load. How a load of 600 Mw would be shared between them ? What will be system frequency at this load ? State the assumptions. 10

3. (a) Explain the equal area criterion of stability for the sudden change in mechanical input. 10
   (b) Find the steady state power limit of a system consisting of a generator equivalent reactance 0·50 pu, connected to an infinite bus bar through a series reactance of 1·0 pu. The terminal voltage of generator is held at 1·20 pu and voltage of infinite bus is 1·0 pu. 10

4. (a) Write an algorithm for G.S. method for load flow analysis when buses present are PQ and PV. 10
   (b) Compare GS and NR methods for load flow. 10

5. (a) Explain the step by step solution of swing equation. 10
   (b) Discuss the dynamic response of an isolated power system. 10

6. (a) Derive the condition of economic load dispatch considering the transmission losses. 10
   (b) A synchronous motor of negligible resistance is receiving 25% of power that is capable of receiving from an infinite bus. If load on synchronous motor is suddenly doubled, calculate the maximum value of power angle δ during the swinging of motor around its new equilibrium position (assume $P_e = 1 \sin \delta$). 10

7. Write short notes on :– 20
   (a) Sources and effects of harmonics
   (b) Methods of voltage control
   (c) Various types of buses in load flow study.