Total No. of Questions : **08** Roll No. : 0701……………………………..

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-6301 CONTROL SYSTEM

Time : Three Hours

Maximum Marks : 70
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Explain the concept of feedback. How does it improve the performance of control systems? Illustrate with examples. ***06***

(b) Define and derive Sensitivity S_G^T for a closed loop standard system, where T is Transfer function and G is forward path Gain of the system. ***08***

2(a) Obtain the transfer function for the system, ***06***

$$\dot{X} = \begin{bmatrix} -1 & 0 & -1 \\ 0 & -1 & 1 \\ 1 & -2 & -3 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} u$$

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

(b) For the system given in the above question, determine the observability and controllability of the system by using Kalman's Test. ***08***

3(a) State and explain the Nyquist stability criterion. Also explain the gain margin and phase margin with the help of polar plots. ***06***

(b) What is a lag compensator? Derive its transfer function and discuss its effect on steady-state error and system bandwidth. ***08***

4(a) Evaluate the steady state error e_{ss} for the following system : ***07***

$$G(s) = \frac{160}{s^2(s+1)(s+20)}$$

When unit step and unit ramp inputs applied to it.

(b) Define and derive expressions for time domain specifications such as rise time, peak time, peak overshoot, and settling time. ***07***

5 The open loop transfer function of a unity feedback system is given by, ***14***

$$G(s) = \frac{K}{s(\tau s + 1)} \qquad K, \tau > 0$$

With a given value of K, the peak overshoot was found to be 80%. It is proposed to reduce the peak overshoot to 20% by decreasing the gain. Find the new value of K in terms of the old value.

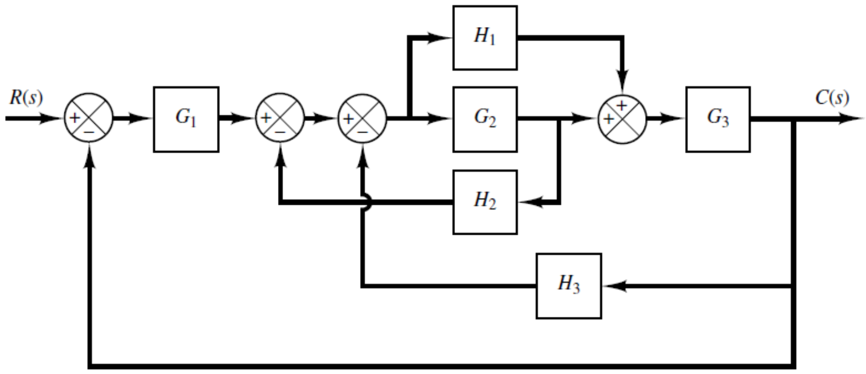
P.T.O.

6 State and explain the Routh-Hurwitz stability criterion. Apply it to test the stability of the system with characteristic equation: ***14***

$$D(s) = s^6 + s^5 + 7s^4 + 6s^3 + 31s^2 + 25s + 25$$

Also determine the number of poles on right side of s-plane.

7 Convert the following block diagram into signal flow graph and obtain the overall transfer function by using Mason's Gain Formula. ***14***



8 Obtain the root locus of a unity feedback system with ***14***

$$G(s) = \frac{K(s+4)}{s^2 + 2s + 2}$$

Clearly mention the breakaway / break-in points and departure angles on the root locus diagram.

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Total No. of Questions : **08** Roll No. : 0701....................................

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-6302 POWER SYSTEM - III

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Differentiate clearly between steady state stability and dynamic stability. ***03***

(b) With the help of a suitable example, show that the direction of active power flow depends upon the power angle 'δ'. ***04***

(c) Show that the maximum power can be transferred from sending to receiving end when the reactance at the line is $\sqrt{3}$ times of its resistance. ***07***

2(a) Explain why, in a two machine system, it is advisable to have resistance grounding at the sending end and reactance grounding at the receiving end? ***04***

(b) Give the advantages of point by point method over the equal area criterion. ***03***

(c) A 50Hz generator is supplying 40% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and infinite bus to 600% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 80% of the original maximum value. Determine the critical clearing angle for the condition described. ***07***

3(a) With a neat diagram, explain briefly the function of various parts of a turbine speed governing system. ***07***

(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. Assume that the generators are operating at 50 Hz, at no load. How would a load of 400 MW be shared between them? What will be the system frequency at this load? ***07***

4(a) Explain and compare the generation and absorption of reactive power in overhead transmission lines and underground cables. Give the reason for the difference in surge impedance loading of transmission lines and underground cables. ***07***

(b) With a neat diagram, explain the working of an online tap changing transformer. ***05***

(c) How the power transfer capability of a transmission line is enhanced by series compensation. ***02***

5(a) Describe a static condenser based compensation system. ***07***

(b) What are necessary conditions under which power is transmitted through an interconnected grid system? Discuss the advantages and limitations of interconnected system. ***07***

P.T.O.

6(a) Describe the constraints of economic loading of transmission system. ***07***

(b) Describe the problems associated with modern interconnected power system. ***07***

7(a) Will the value of short circuit current change if we take different base kVAs? Explain your answer. ***03***

(b) Describe the steps helpful in solving three phase faults. ***04***

(c) A 3-phase transmission line operating at 10 kV and having a resistance of 1 ohm and reactance of 4 ohm is connected to the generating station bus bar through 5 MVA step up transformer having a reactance of 5%. The bus bars are supplied by a 10 MVA alternator having 10% reactance. Calculate the short circuit kVA fed to the symmetrical fault between phases, if it occurs at the load end of the transmission line. ***07***

8(a) Derive an expression for the fault current for a single line to ground fault by symmetrical components. ***07***

(b) A 25 MVA, 13.2 KV alternator with grounded neutral has a sub transient reactance of 0.25 p.u. The negative and zero sequence reactances are 0.35 and 0.1 p.u. respectively. A line to line fault occurs at the terminals of an unloaded alternator. Determine the fault current and the line to line voltage. Neglect resistance. ***07***

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Total No. of Questions : **08** Roll No. : 0701……………………………..

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-6303 POWER ELECTRONICS

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Draw and explain the transfer and output characteristics of fully controlled power semiconductor devices. ***07***

(b) Draw and explain the static and dynamic characteristics of a thyristor. ***07***

2(a) What are the firing techniques of an SCR? Explain the operation of synchronized UJT triggering with a neat circuit diagram and output pulse waveforms. ***07***

(b) A single phase half controlled bridge (semi controlled) rectifier is fed from 230 V, 50 Hz while the load resistance is 10 ohm and the firing angle is 30 degree. Calculate :- ***07***

(i) average output voltage and current (ii) rms output voltage and current.

3(a) Describe the operation of a single-phase dual converter with neat circuit and output waveform diagrams. Compare its operation with that of a single-phase cycloconverter. ***07***

(b) What are the techniques for power factor improvement? Explain the extinction angle control technique with the help of a circuit diagram and output waveforms. ***07***

4(a) Describe the operation of a three-phase AC voltage controller for an RL load with neat circuit & output waveform diagrams and derive an expression for RMS output voltage. ***07***

(b) A single phase ON-OFF ac voltage controller is used for heating a resistive load of R = 10 ohm and the input voltage is V_s = 230 V, 50 Hz. The thyristor switch is on for n = 25 cycles and is off for m = 75 cycles. Determine :- ***07***

(i) the rms output voltage and (ii) average and rms thyristor currents.

5(a) Explain the operation of a step-down chopper for an RL load with a neat circuit diagram and output waveforms. ***07***

(b) A step-up chopper is used to deliver load voltage 500V from 200V dc source. If the blocking period of the thyristor is 80 micro seconds, compute the required pulse width. This chopper can be used in drive using current limiting control scheme, the maximum possible value of the accelerating current is is 300A, the lower limit of the current pulsation is 150A. Calculate the chopping frequency and duty cycle. ***07***

6(a) Describe the operation of a buck regulator with a neat circuit diagram and output waveforms. Briefly explain the effects of filter inductance and capacitance, as well as the concepts of critical inductance and critical capacitance. ***07***

(b) Explain the operation of a single-phase PWM full bridge voltage source inverter with a neat circuit diagram and output waveforms. Compare a voltage source inverter with a current source inverter. ***07***

P.T.O.

7(a) Describe the operation of a three-phase voltage source inverter (VSI) operating in 180-degree conduction mode, with a neat circuit diagram and output waveforms. ***07***

(b) Explain the principle of operation of any one type of multilevel inverter with a neat circuit diagram. Compare it with a two-level inverter. Compare it with a two-level inverter. ***07***

8 Write short notes on **any two**: ***14***

(i) Commutation techniques
(ii) Single phase Current source inverter
(iii) Single phase to single phase cycloconverter (for 50 Hz to 16.33 Hz)
(iv) Pan and unity power factor ac voltage controller.

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Total No. of Questions : **08** Roll No. : 0701.......................................

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EE-6311 (EL-I) ELECTRICAL MACHINE DESIGN

Time : Three Hours *Maximum Marks : 70*
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Explain how the rating of any electrical machine is decided? Discuss various types of power ratings. ***07***

(b) Define specific electric and magnetic loadings .Why they are important in design? ***07***

2(a) Define window space factor? How it is related to the kVA rating of transformer? ***07***

(b) Derive output equation of three ph. power transformer. ***07***

3(a) Draw the magnetic circuit of a 4 pole d.c. machine and show the flux distribution in each part. Which part works near the magnetic saturation? ***07***

(b) Derive the expression for ampere turns per pole of the air gap considering the effect of slots and ventilating ducts. ***07***

4(a) Discuss the criteria of number of poles selection in dc machine design. ***07***

(b) Design a 10 kW, 4 pole, 220V, 1500 rpm d.c. shunt generator w.r.t. following : ***07***

(i) Output Coefficient (ii) Gross length of Armature
(iii) Diameter of Armature (iv) Number of Armature conductors

Assume suitable values of design parameters.

5(a) Derive output equation of three phase induction motor. How the main dimensions of the motor can be estimated with the help of output equation? ***07***

(b) How the design and performance of induction motor depends on air gap length? ***07***

6(a) Discuss the methods of cooling provided in power transformers. ***07***

(b) Explain how the performance of an induction motor can be pre determine at the design stage? ***07***

7(a) Turbo alternators have cylindrical rotor where as hydro alternators have salient poles. Give reason. ***03***

(b) Discuss the effect of short circuit ratio in synchronous machine design. ***04***

(c) Derive the relation between the output and size of synchronous motor. ***07***

8 Write short notes on **any two** : ***2*7***

(i) Types of transformer windings (ii) Advantages of short pitched coils
(iii) Field system design in alternators (iv) Reactance calculation for sandwiched coil

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Total No. of Questions : **08** Roll No. : 0701......................................

B.Tech SIXTH SEMESTER EXAMINATION JUNE-2025

(Branch : Electrical Engineering)

EC-6351 (OEL-II) MICROPROCESSOR

Time : Three Hours *Maximum Marks : 70*
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a)	Explain the operation of "Bus interface unit" of 8086 Microprocessor.	***07***
(b)	Explain in detail the Flag register of 8086.	***07***
2(a)	Explain following pins of 8086 Microprocessor : (i) NMI (ii) CLK (iii) INTR (iv) READY.	***07***
(b)	Explain stack structure of 8086 Microprocessor.	***07***
3(a)	Draw and explain the functional block diagram of 8257 DMA controller.	***07***
(b)	Write a short note on 8255 PPI.	***07***
4(a)	Differentiate between the Memory mapped I/O and the Peripheral I/O.	***07***
(b)	Draw and explain the schematic to interface an ADC with 8086.	***07***
5(a)	Draw and explain the functional flock diagram of 8051 Microcontroller.	***07***
(b)	Explain memory organization of 8051Microcontroller.	***07***
6(a)	Explain following instructions of 8051Microcontroller : (i) MOV (ii) INC (iii) JMP (iv) CLR.	***07***
(b)	Write an assembly language program for 8051 to add two 8-bit numbers. Store the result in a suitable memory location.	***07***
7(a)	With examples, explain various addressing modes of 8051.	***07***
(b)	Explain the function of Timer/counter in 8051.	***07***
8	Write short notes on **any two** : (i) Embedded system (ii) Stepper motor interfacing (iii) 8051 connection to RS-232.	***14***

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