Q.P. code: 10030296

T.E. 5th Sem (R-19-20 C Scheme) Electrical

Time: 3 hrs. Total Marks:80

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

(2) Attempt any three from the remaining questions

(3)Assumptions made should be clearly stated.

(4) Figure to the right indicates full Marks.

Q1	Attempt any four	20 Marks
a.	State the advantages of keeping armature stationary in synchronous machine.	5
b.	Elaborate classification of synchronous machine on the basis of rotor construction.	5
c.	What is Armature Reaction? Explain the effect of Armature reaction on the terminal voltage of Alternator at unity power factor load.	5
d.	"Synchronous Motor is not self starting" Justify the statement	5
e.	Draw P-d curve for salient pole alternator with active power equation.	5
Q2.		
a.	Derive the expression for EMF induced in alternator.	10
b.	A 3-phase, 50 Hz alternator is running at 600 rpm has a 2-layer winding, 12 turns/coil, 4 slots/pole/phase, and coil-pitch of 10 slots. Let us find the induced EMF per phase if the flux/pole is 0.035 webers.	10
Q3.		
a.	Illustrate MMF method with advantages and limitations.	10
b.	Derive the expression for pitch factor and distribution factor and derive formula for Kp and Kd.	10
Q4.		
a.	Two station alternators A and B operate in parallel. The Station capacity of A is 30 MW and that of B is 60 MW. The full-load speed regulation of station A is 4% and full-load speed regulation of B is 4.5%. Calculate the load sharing if the connected load is 60 MW. No-load frequency is 50 Hz.	10
b.	State and explain conditions for satisfactory synchronisation with grid.	10

Q5.

a. Elaborate 'V' and 'inverted V' curve in synchronous motor. 10

b. State various starting methods of synchronous motor and explain any one in brief

Q6

a. Explain steady state analysis 3 phase synchronous machine. 10

b. Elaborate slip test on synchronous machine and comment on direct and quadrature axis reactance. 10

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TE sem V Electrical R-19 C scheme QP code : 10095593

Duration : 03 hrs **Maximum Marks = 80**

NOTE
1. Question No 1 is Compulsory.
2. Attempt any three questions out of the remaining five questions.
3. Assume the suitable data if necessary and justify the same.

Question no.	Question	Marks
Q.1 A	Explain the terms short circuit MVA and symmetrical fault.	05
Q.1 B	Describe the volt time curve as required for insulation coordination studies in power system with an example	05
Q.1 C	Discuss in brief the significance of tower footing resistance	05
Q.1 D	Describe the working principle of lightning arrester. Explain any arrester in detail.	05
Q.2 A	Illustrate the short circuit of a synchronous machine at no load condition.	10
Q.2 B	Build the Z-bus for the 3 Bus network in which elements are connected as Bus 1-Bus 2: j0.2; Bus 1-Bus 2: j0.4; Bus 1-Bus3: j0.35 Bus 2-Bus 3: j0.25. (Assume Bus 3 as a reference bus)	10
Q.3 A	Explain and draw the zero sequence networks for following types of connections of a three phase transformer i) Delta-Delta ii) Delta-Star(ungrounded) iii) Delta-Star(Grounded) iv) Star(Grounded)- Star(Grounded) v) Star(ungrounded)- Star(ungrounded)	10
Q.3 B	Derive the equation for fault current and sequence network for single line to ground fault. State the various assumptions in derivation.	10
Q.4 A	A star connected balanced load of 10ohm each has the following voltages across its terminals Vab=200V, Vbc=220V and Vca=180V.Calculate the symmetrical components of line and phase voltages. From the symmetrical components of line voltages determine the line current.	10
Q.4 B	Describe the generation of voltage and current travelling waves on a short circuited line with figure and equations.	10

Q.5 A	Explain the principle of lightning phenomenon and protection against lightning with respect to the power system.	**10**
Q.5 B	Discuss the advantages and disadvantages of Corona	**10**
Q.6 A	Describe the Z-bus formulation.	**10**
Q.6 B	Explain the following (i) critical disruptive voltage and visual disruptive voltage (ii) transient recovery voltage	**10**

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TE sem V Electrical R-19 C scheme

Time: 3 Hours **Total Marks: 80**

N.B: (1) Question No. 1 is compulsory.
(2) Attempt any three from the remaining questions.
(3) Figures to the right indicate full marks.
(4) Use Graph paper and semi log paper wherever necessary.

1. Attempt any four
   (A)Write an example of open loop system and Automatic Close loop system
   (B)Calculate Steady state error for first order system for unit step and find Position error constant
   (C) Explain Nyquist criterion for stability.
   (D) Explain advantages of state space approach over conventional approach.
   (E) Describe the condition for angle of departure angle of Arrival in root locus.

2. (A) Consider a unity feedback system with close loop transfer function $C(s)/R(s)= 2 \quad (s^2+3s+7)$. Find open loop transfer function. Calculate Steady state error.

   (B) Determine the range of operating values of K so that system will be stable for the unity feedback system having characteristic equation as $s^4+3s^3+Ks^2+2s+1=0$ by Routh Hurwitz Method.

3. (A) Find out all time domain parameters for the second order underdamped transfer function $C(S)/R(S)= 12(S^2 +4S +8)$. Also find out expression of output response

   (B) Find Type of a system, all error constants and find steady state error for unit ramp input.

$$G(S)=1000(S+2)/S(S^3+7S^2 +12S)$$

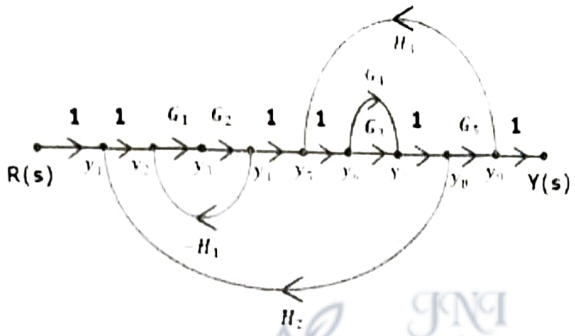
4. (A) Determine gain margin, phase margin, gain crossover frequency and phase cross over frequency for following transfer function:

$$G(s) = \frac{100}{s(s+2)(s+5)}$$

   (B) Sketch the root locus for unity feedback system for the transfer function given below:

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

5. (A) Use Mason gain formula to find C(s)/R(s) of following signal flow graph:



(B) Obtain state model of the transfer function $T(F)= (S^2+3S+3)/(S^3+2S^2+3S+1)$. Draw signal flow graph

6. Write notes on any two:

(A) Write a short note on Time response specifications.

(B) Define Gain Margin, Phase Margin, Phase cross over frequency and gain Cross over Frequency in frequency domain

(C) Compute the transfer function from state space model if

$A= [0\ 1\ -3\ -8]$

$B = [0\ 1]$ $C= [3\ 4]$ $D = 0$

QP code : 10094142

TE sem V Electrical R-19 Cscheme

Time: 3 Hours **Max. Marks: 80**

Note :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

Q. 1 Solve **ANY FOUR** questions from following. (Each question carries 5 marks)

a) Show that for sinusoidally varying field the conduction current and the displacement currents are always displaced from each other by 90° in time. **(05)**

b) Prove that "The line integral of the magnetic field around some close loop is equal to the sum of the currents which pass through the loops". **(05)**

c) State and describe Biot Savart Law. **(05)**

d) Given $\bar{A} = \overline{a_x} + 2\overline{a_y} - 3\,\overline{a_z}$ and $\bar{B} = 2\overline{a_x} - \overline{a_y} + \overline{a_z}$. Determine, **(05)**
a. Projection of $\bar{B}$ on $\bar{A}$
b. The smaller angle between $\bar{A}$ *and* $\bar{B}$.

e) How is magnetic potential analogous to electric potential? **(05)**

Q. 2 a) Draw rectangular, cylindrical and spherical co-ordinate system and explain differential element dl, differential surface ds and differential volume dv for all coordinate system **(10)**

Q. 2 b) Show that the $\bar{E}$ due to infinite sheet of charge at a point is independent of the distance of that point form the plane containing the charge. **(10)**

Q. 3 a) An infinite long current filament is placed along z-axis. The magnetic field intensity at point P(6,8,0) is $10\left(-1.6\overline{a_x} + 1.2\overline{a_y}\right) A/m$. Find current through the filament. **(10)**

Q. 3 b) Derive the Poission's and Laplace equation. In Cartesian co-ordinate a potential is a function of x only. At $x = -2\ cm, V = 25\ V\ and\ \bar{E} = -1.5 \times 10^3 \overline{a_x}\ V/m$ throughout the region. Find V at x=5 cm. **(10)**

Q. 4 a) Derive expression for magnetic field intensity due to infinite & finite wire carrying current I. **(10)**

Q. 4 b) Find $\bar{D}, \bar{B}\ and\ \bar{H}$ displacement current density in free space, given $\bar{E} = E_m \sin(\omega t - \beta z)\overline{a_y}$. **(10)**

Q. 5 a) Discuss the phenomenon of electric polarization in dielectric medium. **(10)**

Q. 5 b) State the Maxwell's equations for time varying fields in integral and point forms. Also explains the physical significance of each equation. **(10)**

Q. 6 a) Formulate wave equation from maxwell's equation. Solve it for perfectly conducting media. **(10)**

Q. 6 b) Consider a pair of point charges in free space: charge q = -300 μc is located at (2, 4, 5) m and charge Q = 10 μc is located at (1, 1, 3) m. what is the force magnitude on q. **(10)**

QPcode: 10081968

TE Sem VI th Electrical R-19 C Scheme

3 Hours) Marks: 80

Note: - 1. Question No. 1 is compulsory.

2. Attempt any **three** questions out of remaining **five** questions.

3. Assume suitable data if necessary & justify the same.

4. Figures to the right indicate marks.

Qu.1 **Attempt any Four.**

(a) Discuss the various losses occurs in solar cell. [5]

(b) Discuss the effect of hot spots in Solar PV module [5]

(c) Differentiate between Horizontal axis and Vertical axis wind turbine system. [5]

(d) Draw and describe the static characteristics of fuel cell in brief [5]

(e) Write a short note on tidal energy generation [5]

(f) Write a short note on solar pond. [5]

Qu.2 (a) Explain any two types of concentrating collectors in brief. State its advantages [10]

(b) Discuss the power electronics topologies for fuel cell along with neat diagram. [10]

Qu.3 (a) Illustrate the significance of MPPT in Solar PV system with neat block diagram. Explain perturb and observe MPPT algorithms with the help of suitable diagram. [10]

(b) What are the different methods to use solar thermal energy? How Solar air heater is useful for energy generation? Explain [10]

Qu.4 (a) Enlist the topologies of wind energy system. Discuss the power converter topology used for double feed induction generators (DFIG) in wind turbines. [10]

(b) Analyze the impact of change in solar radiation and temperature on solar PV characteristics with a neat diagram. [10]

Qu.5 (a) Discuss the types of stand-alone PV system configurations. Explain it in brief [10]

(b) Explains the working of wind energy system along with its various components. Also discuss the wind power curve in detail [10]

Qu.6 (a) Draw the two junction model of solar cell. Also draw I-V and P-V characteristics of solar cell at STC. Analyze the impact of change in series and shunt resistance on the efficiency of solar cell. [10]

(b) Explain the working principle of Ocean energy conversation system with neat diagram. [10]

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QPcode:10082680

TE Sem V th Electrical R-19 cscheme

Time: 3 Hours

Max. Marks: 80

Note :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.

			Marks
Q. 1		Solve **ANY FOUR** questions from following. (Each question carries 5 marks)	
	a)	"The line integral of the magnetic field around some closed loop is equal to the sum of the currents which pass through the loop". Justify the statement.	(05)
	b)	Explain Lorentz's force equation for moving charge. Enlist it's application	(05)
	c)	Point charge Q=0.2 μC placed at origin,find electric field instensity at (0,6,8)m.	(05)
	d)	Define scalar and vector quantity with example. Also state coulomb's law.	(05)
	e)	State and derive the polarization of a dielectric materials.	(05)
Q. 2	a)	Define Biot-Savart's Law & use it to derive expression for magnetic field intensity due to infinite wire carrying current I.	(10)
Q. 2	b)	Show that the $\bar{E}$ due to infinte sheet of charge at a point is independent of the distance of that point form the plane containing the charge.	(10)
Q. 3	a)	An infinite long current filament is placed along z-axis. The magnetic field intensity at point P(6,8,0) is $10(-1.6\overline{a_x} + 1.2\overline{a_y})\ A/m$. Find current through the filament.	(10)
Q. 3	b)	Derive Maxwell's second equation in both integral and point form.	(10)
Q. 4	a)	Formulate electromagnetic wave equation from Maxwell's equation for dielectric medium.	(10)
Q. 4	b)	Find $\bar{D}, \bar{B}$ and $\bar{H}$ displacement current density in free space, given $\bar{E} = E_m \sin(\omega t - \beta z)\overline{a_y}$.	(10)
Q. 5	a)	Prove that $E = -\nabla.V$. Also derive the Poission's and Laplace equation .	(10)
Q. 5	b)	In Cartesian co-ordinate a potential is a function of x only. At $x = -2\ cm, V = 25\ V$ and $\bar{E} = -1.5 \times 10^3 \overline{a_x}\ V/m$ throughout the region. Find V at x=5 cm.	(10)
Q. 6	a)	Draw rectangular, cylindrical and spherical co-ordinate system and explain differential element dl, differential surface ds and differential volume dv for all coordinate system	(10)
Q. 6	b)	A Charge $Q_1 = -20\mu C$ is placed at P(-6,4,6) m and a charge $Q_2 = 50\mu C$ is placed at R(5,8,-2) m in free space. Calculate the exerted force on Q_2 by Q_1 in vector form.	(10)

QPcode, 10086899

TE Sem V th Electrical R-19 C scheme

Time: 3 Hrs **Marks: 80**

N.B: (1) Question No 1 is compulsory.
(2) Attempt any three from the remaining questions.
(3) Figures to the right indicate full marks.
(4) Use Graph paper and semi log paper wherever necessary.

1. Attempt any four
   (A)What are the different element of a closed loop control system.
   (B)Derive force to voltage analogy between mechanical and electrical system.
   (C) Explain Nyquist criterion for stability.
   (D) Explain advantages of state space approach over conventional approach.
   (E) Find break away point for root locus of open loop transfer system
   G (s)=K/S(S+8) (S+2)

2. (A)For a unity feedback system with open loop transfer function
   $G(s)=100(s+5)/S\ (S^2+7S+20)\ (S+10)$, Determine order, type of system, kp, kv, ka and steady state error for unit ramp input.
   (B) Determine the range of operating values of K so that system will be stable for the unity feedback system having characteristic equation as $S^4+5S^3+5S^2+4s+k = 0$ by Routh Hurwitz Method.

3. (A) For the unity feedback system find the steady state error for the following test input of 6t for G(s)=1000(S+6) / (S+7) (S+10).
   (B) For the unity feedback system with open loop transfer function G(s)=K/S(S+10) Determine K, peak overshoot, settling time, time to peak overshoot for step input if damping factor is 0.5.

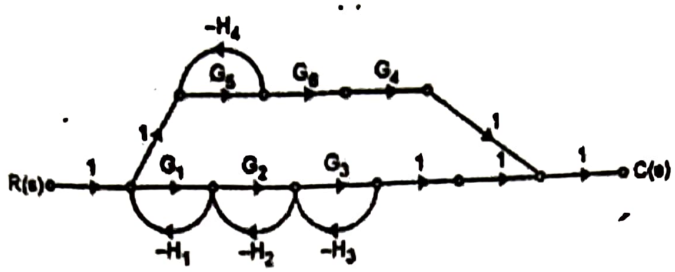
4. (A)Determine gain margin, phase margin, gain crossover frequency and phase cross over frequency for following transfer function:

$$G(s) = \frac{80}{s(s+2)(s+20)}$$

   (B) Sketch the root locus for unity feedback system for the transfer function given below:

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

5. (A) Use Mason gain formula to find C(s)/R(s) of following signal flow graph:



(B) Represent the following system in state space in phase variable form and draw its state model.

$$G(s) = \frac{20(s+5)}{s(s+1)(s+4)}$$

6. Write notes on any two:

(A) Write a short note on Time response specifications.
(B) Define Gain Margin, Phase Margin, Phase cross over frequency and gain Cross over Frequency in frequency domain
(C) Write a short note on State Transition Matrix.

QPcode: 1008675

TE Sem V Electrical R-19 Cscheme

Duration – 3 Hours **Total Marks - 80**

N.B.: - (1) Question No.1 is compulsory.
(2) **Attempt** any **Three** questions out of the remaining **five** questions.
(3) Assume suitable data if necessary and justify the same.

Q 1. Answer **all questions.**

A) Discuss the role of bundle conductors in corona **0**

B) A travelling wave when reaches the end of open circuited transmission line, determine the following: **0**
-Transmitted voltage and current
-Reflected voltage and current.

C) Illustrate zero sequence network of the transformer for following conditions. **0**
(i) Primary winding star connected with neutral isolated and secondary winding Star connected with neutral grounded
(ii) Primary winding delta connected and secondary winding delta connected

D) Explain the selection of circuit breaker for power system protection **0**

Q 2 a) Derive the equation for fault current when fault occurs between line and ground of a three phase transmission line. Also draw interconnection of sequence network for the same fault **1**

Q 2 b) The line currents in a 3-phase supply to an unbalanced load are respectively Ia = 10 + j20, Ib = 12– j10 and Ic = - 3 – j5 amperes. The phase sequence is abc. Determine the sequence components of currents. **1**

Q 3 a) Summarize different algorithms of Z_{bus} formulation. **1**

Q 3 b) A 30 MVA, 11 kV generator has $Z_1=Z_2=j0.2$pu, $Z_0=j0.05$ pu. A line-to-line fault occurs on the generator terminals. Calculate the fault current. Assume that the generator neutral is solidly grounded and that the generator is operating at no load and at rated voltage at the occurrence of the fault. **1**

Q 4 a) Illustrate the short circuit of synchronous machine at no load condition. **1**

Q 4 b) Discuss the phase shift of symmetrical components in star delta transformer **1**

Q 5 a) Why Insulation Coordination is required? Explain the following: **1**
1. Surge Reactor 2. Surge Capacitor 3. Lightning Rod

Q 5 b) Discuss the generation of Voltage and current travelling waves on a short circuited line with figure and equations **1**

Q 6 a) Discuss the generation and formation of corona rings and corona pulses in EHV lines. **1**

Q 6 b) What is arcing ground? Explain its effect on the performance of a power system. **1**

Paper / Subject Code: 32021 / Electrical AC Machines II

Qpcode: 10081474

TE Sem V th Electrical R-19 CS scheme

(3 Hours) [Total Marks: 80]

N.B. 1) Question No. 1 is compulsory

2) Attempt any three of the remaining Questions No. 2 to No. 6.

3) Illustrate answers with diagrams wherever necessary.

4) Assumptions made should be clearly stated.

Q 1. Solve any four

a) Why is rotating field system used in preference to a stationary field? **05**

b) Define voltage regulation. List out different methods to calculate voltage regulation. **05**

c) State the conditions necessary for paralleling alternators. **05**

d) Write a note on Steady-state analysis of synchronous machines. **05**

e) Explain the principle of operation of a 3-phase synchronous motor. **05**

Q 2. a) Explain the phenomena of armature reaction when an alternator is delivering a load current at a) purely lagging pf b) unity pf c) purely leading pf. **10**

b) Explain how open circuit and short circuit test are conducted on a synchronous machine. What is an air gap line? **10**

Q 3. a) State the applications of synchronous motors. Compare synchronous motor with three phase induction motor. **10**

b) Two station generators A and B operate in parallel. Station capacity of A is 50 MW and that of B is 100 MW. The full-load speed regulation of station A and station B is 4 %. Calculate the load sharing if the connected load is 100 MW. The no-load frequency is 50 Hz. **10**

Q 4. a) Explain the effect of varying excitation on armature current and power factor in a synchronous motor. Draw V-curves and state their significance. **10**

b) Draw equivalent circuit and phasor diagrams for different loads of a cylindrical rotor synchronous motor. **10**

Q 5. a) Explain Blondel's two-reaction theory of salient-pole synchronous machines. **10**

b) A 1500 KVA, Star connected, 2300 V, 3 phase, Salient pole synchronous generator has reactances Xd= 1.95 Ohms and Xq=1.40 ohms per phase. All losses may neglected. Find the excitation voltage for operation at rated KVA and power factor of 0.85 lagging. **10**

Q 6. Solve any two. **20**

a) Derive the basic machine relation in dq0 Variables.

b) Explain two important function served by damper winding in a synchronous machines.

c) What is an infinite bus? State the characteristics of an infinite bus.

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