CBCS Scheme

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15EE61

# Sixth Semester B.E. Degree Examination, June/July 2018
## Control System

Time: 3 hrs. Max. Marks: 80

**Note:** ***Answer FIVE full questions, choosing one full question from each module.***



### Module-1

1 a. With the help of neat block diagram, define open loop and closed loop control system. Mention any four difference between open loop and closed loop control system. **(08 Marks)**

b. Construct mathematical model for the mechanical system shown in Fig. Q1 (b). Draw electrical equivalent network based on force voltage analogy. **(08 Marks)**

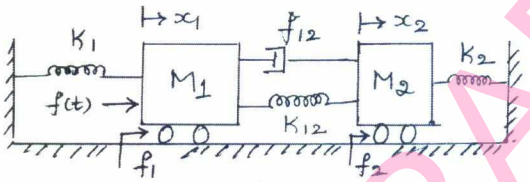


Fig. Q1 (b)

**OR**

2 a. Draw an equivalent mechanical network using force voltage analogy as shown in Fig. Q2 (a). **(08 Marks)**

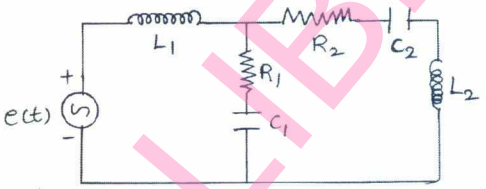


Fig. Q2 (a)

b. For the mechanical translation system as shown in Fig.Q2 (b). Draw the electrical network based on torque current analogy. Write its performance equations. **(08 Marks)**

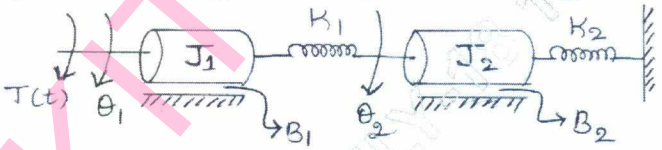


Fig. Q2 (b)

### Module-2

3 a. Illustrate how to perform the following connection with block diagram reduction technique, (i) Shifting summing point after a block (ii) Shifting take off point ahead of a block. **(04 Marks)**

b. Draw a signal flow graph and find its transfer function as shown in Fig. Q3 (b). **(06 Marks)**

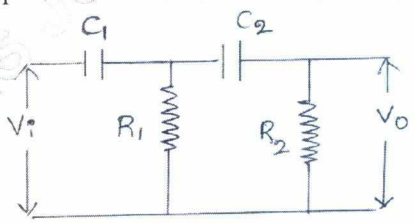


Fig. Q3 (b)

c. Determine the transfer function, $\frac{C(s)}{R(s)}$ of a system shown in Fig. Q3 (c). **(06 Marks)**

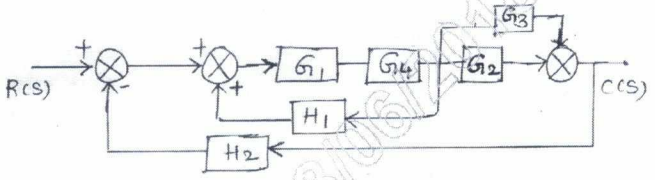


Fig. Q3 (c)

**OR**

4 a. Obtain $\frac{C(s)}{R(s)}$ using block diagram reduction rule. **(08 Marks)**

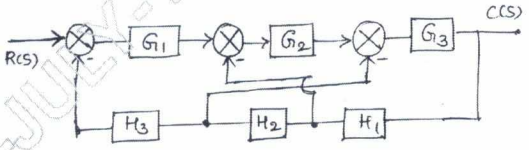


Fig. Q4 (a)

b. Find the transfer function $\frac{x_5}{x_1}$ to the signal flow graph shown in Fig. Q4 (b). Apply the Mason's gain formula. **(08 Marks)**

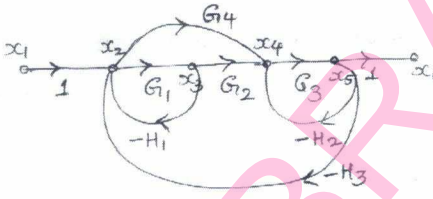


Fig. Q4 (b)

## Module-3

5 a. What are necessary and sufficient condition for a system to be stable according to RH criteria. **(04 Marks)**

b. Determine the stability of the system represent by following characteristic equation, $s^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4 = 0$. **(04 Marks)**

c. The system shown in Fig. Q5 (c) when subjected to a unit step input gives an output response shown in Fig. Q5 (c). Determine the value of K and T from response curve. **(08 Marks)**

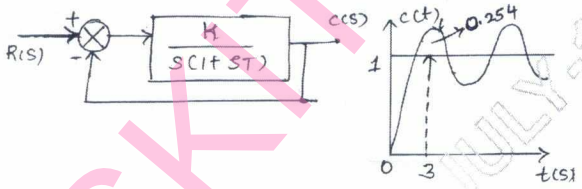


Fig. Q5 (c)

**OR**

6 a. A system oscillate with frequency "ω" if it has a pole at $s = \pm j\omega$ and no pole in right half of s plane. Determine the value of K and 'a' so that the system shown in Fig. Q6 (a). Oscillate at a frequency of 2 rad/sec. **(08 Marks)**

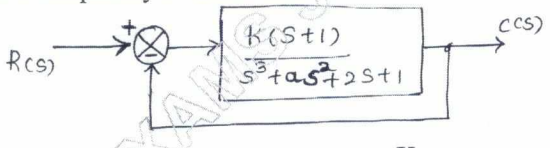


Fig. Q6 (a)

b. For the system $G(s)H(s) = \frac{K}{s^2(s+2)(s+3)}$ find the value of K to limit steady state error to 10 unit when input to the system is $1 + 10t + \frac{40t^2}{2}$. **(08 Marks)**

## Module-4

7 a. For a single loop unity feedback system whose open loop transfer function is $G(s) = \frac{K(s+3)}{s(s+2)}$ show that complex part of root locus is a circle and identify center and radius. **(06 Marks)**

b. Draw the bode plot for the system having $G(s) = \frac{10}{s(1+0.01s)(1+0.1s)}$, $H(s) = 1$.

Determine :

(i) Gain crossover frequency and phase margin.

(ii) Phase cross over frequency and gain margin. **(10 Marks)**

**OR**

8 a. Sketch complete root locus of system having $G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$. **(10 Marks)**

b. Find the open loop transfer function of a system whose approximate plot is as shown in Fig. Q8 (b). **(06 Marks)**

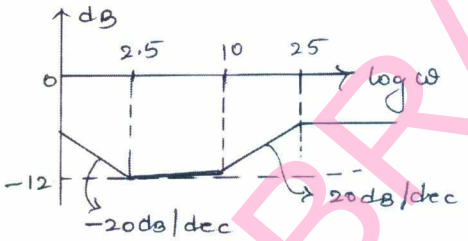


Fig. Q8 (b)

## Module-5

9 a. Explain the step by step design procedure of lead compensation network. **(08 Marks)**

b. Sketch the Nyquist plot by unity feedback system whose open loop transfer function, $G(s) = \frac{5}{s(1-s)}$. Determine stability of a system using Nyquist stability criteria. **(08 Marks)**

**OR**

10 a. Explain Nyquist stability criteria. **(04 Marks)**

b. What is controller? Explain the effect of PI and PD controller on second order system. **(06 Marks)**

c. Explain the principle of Argument in Nyquist stability criteria. **(06 Marks)**

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15EE62

# Sixth Semester B.E. Degree Examination, June/July 2018
## Power System Analysis – I

Time: 3 hrs. Max. Marks: 80

**Note:** ***Answer FIVE full questions, choosing one full question from each module.***



### Module-1

1 a. With suitable example explain one line diagram and discuss the elements represented. **(06 Marks)**

b. Draw the per unit reactions diagram for the power system shown in Fig. Q1 (b). Selecting the generator rating as the base. Also find the generator terminal voltage.

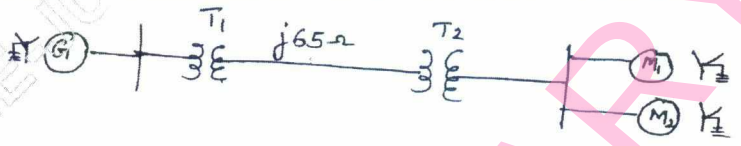


Fig. Q1 (b)

The ratings of the various components are,
G = 13.8 kV, 25 MVA, X″ = j0.15 pu ;
$T_1$ = 13.2/69 kV, 25 MVA, X = j0.11 pu; $T_2$ = 69/13.2 kV, 25 MVA, X = j0.11 pu;
$M_1$ = 13 kV, 15 MVA, X″ = j0.15 pu ; $M_2$ = 13 kV, 10 MVA, X″ = j0.15 pu
Determine the generator terminal voltage when both the motors operate at 12 kV 75% full load and unity power factor. **(10 Marks)**

**OR**

2 a. With help of typical electrical power system, explain impedance and reactance diagram and mention the assumptions made in that. **(06 Marks)**

b. The schematic diagram of a radial transmission system is shown in Fig. Q2 (b). The ratings and reactance of the various components are show there in. A load of 60 MW at 0.9 p.f lagging is tapped from 66 kV sub station which is to be maintained at 60 kV. Calculate the terminal voltages of the machine. Represent the transmission line and transformer by series reactance only. **(10 Marks)**

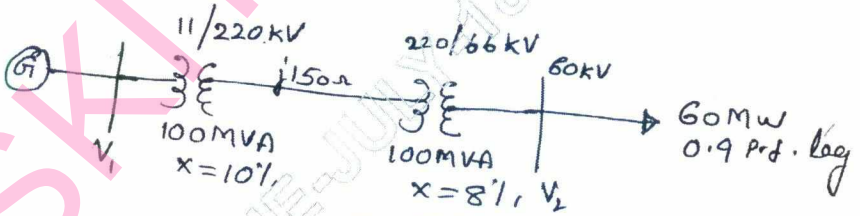


Fig. Q2 (b)

### Module-2

3 a. What is the significance of transient and subtransient reactances in short circuit studies. Distinguish between transient and subtransient reactances of a synchronous machine. **(06 Marks)**

b. For the radial network shown in Fig. Q3 (b) a 3 phase fault occurs at point F. Determine the fault current, choose the generator ratings as base values:
Generator $G_1$: 10 MVA, 11 kV, X″ = 15% ; Generator $G_2$: 10 MVA, 11 kV, X″ = 12.5%
Transformer $T_1$ : 10 MVA, 11/33 kV, X = 10%; Transformer $T_2$ : 5 MVA, 33/6.6 kV, X= 8%
Overhead line impedance z = +j Ω; Feeder impedance z = (0.135 + j0.08) Ω/km **(10 Marks)**

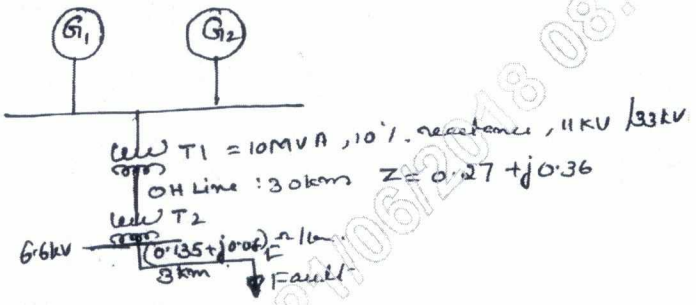


Fig. Q3 (b)

**OR**

4 a. What is doubling effect in a transmission line? Substantiate with equations. **(06 Marks)**

b. Generator $G_1$ and $G_2$ are identical and rated 11 kV, 20 MVA and have a transient reactance of 0.25 pu at own MVA base. The transformer $T_1$ and $T_2$ are also identical and are rated 11/66 kV, 5 MVA and have a reactance of 0.06 p.u. to their own MVA base. The tie line is 50 km long each conductor has a reactance of 0.848 Ω/km. The three phase fault is assumed at F, 20 km from generator $G_1$, as shown in Fig. Q4 (b). Find the short circuit current. **(10 Marks)**

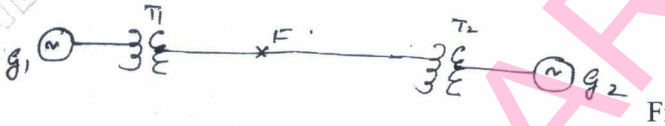


Fig. Q4 (b)

## Module-3

5 a. What are symmetrical components and explain how they are useful in solving the power system problems. **(04 Marks)**

b. Prove that : (i) $(1+\alpha+\alpha^2)=0$ (ii) $(\alpha-\alpha^2)=j\sqrt{3}$ (iii) $(\alpha^2-\alpha)=-j\sqrt{3}$ **(04 Marks)**

c. A balanced delta connected load is connected to a 3 phase symmetrical supply. The line currents are each 10 A in magnitude. If fuse in one of the lines blows out. Determine the sequence components of line currents. **(08 Marks)**

**OR**

6 a. Explain the concept of phase shift in star delta transformer bank. **(06 Marks)**

b. Draw the positive, negative and zero sequence networks for the power system shown in Fig Q6 (b).

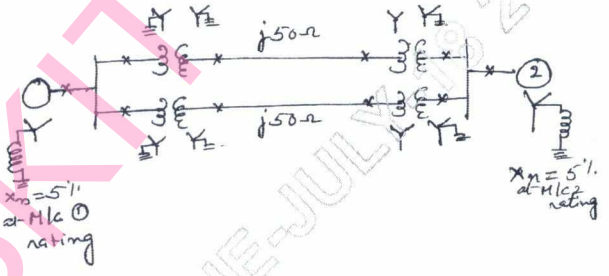


Fig. Q6 (b)

Choose a base of 50 MVA, 220 kV in the 50 Ω transmission lines and mark all reactances in p.u. The ratings of the generators and transformers are:

Generator 1 : 25 MVA, 11 kV, X″ = 20 % ; Generator 2 : 25 MVA, 11 kV, X″ = 20 %

Three phase transformer (each) : 20 MVA, $^{11Y}/_{220Y}$ kV, X = 15%

The negative sequences reactance of each syn machine is equal to the sub transient reactance. The zero sequence of each machine is 8%. Assume that the zero sequence of lines of lines are 250% of their positive sequence reactance. **(10 Marks)**

## Module-4

7 a. Derive an expression for fault current when single line to ground fault occurs through a fault impedance $Z_f$ in a power system. Draw the sequence network to represent the fault. **(10 Marks)**

b. For one conductor open fault in a power system, derive an expression for fault current. **(06 Marks)**

**OR**

8 a. What are the boundary/terminal condition in relation to the unsymmetrical faults. Mention the boundary conditions for LG, LL, LLL and LLG fault. **(06 Marks)**

b. A syn motor is receiving 10 MW of power at 0.8 pf lag at 6 kV. A LG fault takes place at the middle point of the transmission line as shown in Fig. Q8 (b), find the fault current. The ratings of the generator motor and transformer are as under.

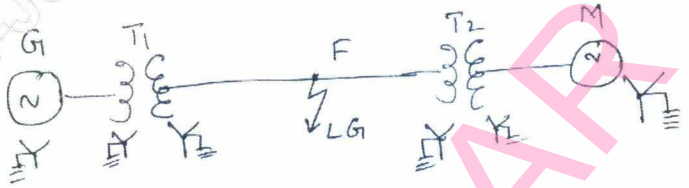


Fig. Q8 (b)

Generator: 20 MVA, 11 kV, $X_1 = 0.2$ pu, $X_2 = 0.1$ pu, $X_0 = 0.1$ pu

$T_1$ : 18 MVA, $^{11.5}/_{34.5}$ kV , X = 0.1 pu

$T_2$ : 15 MVA, $^{6.9}/_{34.5}$ kV , X = 0.1 pu

M : 15 MVA, 6.9 kV, $X_1 = 0.2$ pu, $X_2 = X_0 = 0.1$ pu

Transmission line : $X_1 = X_2 = 5\ \Omega$, $X_0 = 10\ \Omega$ **(10 Marks)**

## Module-5

9 a. Briefly explain (i) Steady state stability (ii) Transient stability. **(06 Marks)**

b. A loss free alternator supplies 50 MW to an infinite bus, the SSSL being 100 MW. Determine if the alternator will remains stable if the input to the prime moves of the alternator is abruptly increased by 40 MW. **(10 Marks)**

**OR**

10 a. State and explain equal area criteria. What are the assumptions made in applying EAC? Discuss. **(06 Marks)**

b. The transfer reactances between a generator and an infinite bus bar operating at 200 kV under various conditions on inter connection are:
Prefault : 150 Ω per phase.
During fault : 400 Ω per phase
Past fault : 200 Ω per phase
If the fault is cleared when the rotor has advanced 60° electrical from the prefault position, determine the maximum load that could be transferred without loss of stability. **(10 Marks)**

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15EE63

# Sixth Semester B.E. Degree Examination, June/July 2018
## Digital Signal Processing

Time: 3 hrs. Max. Marks: 80

***Note: Answer any FIVE full questions, choosing one full question from each module.***



### Module-1

1 a. Compute the N-point DFT of the signal
$x(n) = a^n ; \quad 0 \le n \le N-1$ **(04 Marks)**

b. Using formula to find DFT, compute 4-point DFT of causal signal given by ,
$x(n) = \frac{1}{3} ; \quad 0 \le n \le 2$
$= 0 ; \quad$ elsewhere
Also sketch the magnitude and phase spectra. **(08 Marks)**

c. Consider a length – 12 sequence defined for $0 \le n \le 11$ ; x(n) = (8, 4, 7, –1, 2, 0, –2, – 4. –5, 1, 4, 3) with 12-point DFT given by X(k) ; $0 \le k \le 11$. Evaluate the following function without computing the DFT $\sum_{k=0}^{11} e^{\frac{-j4\pi}{6}K} X(k)$. **(04 Marks)**

**OR**

2 a. A discrete time LTI system has impulse response $h(n) = 2\delta(n) - \delta(n-1)$. Determine the output of the system if the input is $x(n) = \delta(n) + 3\delta(n-1) + 2\delta(n-2) - \delta(n-3) + \delta(n-4)$ using circular convolution by circular array method. Verify the result using formula based method. **(08 Marks)**

b. Find the output y(n) of a filter whose impulse response is given by h(n) = (3, 2, 1, 1) and input signal is given by x(n) = (1, 2, 3, 3, 2, 1, –1, –2, –3, 5, 6, –1, 2, 0, 2, 1) using Overlap – Add method. Use 7-point circular convolution in your approach. **(08 Marks)**

### Module-2

3 a. An 8-point sequence is given by
x(n) = (2, 2, 2, 2, 1, 1, 1, 1).
Compute its DFT by a Radix-2 DIT-FFT algorithm. **(08 Marks)**

b. Derive the algorithm for N = 8 and write the complete signal flow graph. **(08 Marks)**

**OR**

4 a. The first 5-points of the 8-point DFT of a real valued sequence is given by X(0) = 4, X(1) = 1– j2.414, X(2) = 0, X(3) = 1 – j0.414 and X(4) = 0. Write the remaining points and hence find the sequence x(n) using inverse radix-2 DIT-FFT algorithm. **(08 Marks)**

b. If $x_1(n) = (1, 2, 0, 1)$ and $x_2(n) = (1, 3, 3, 1)$ , obtain $x_1(n)$ Ⓝ $x_2(n)$ by using DIF-FFT algorithm. **(08 Marks)**

## Module-3

5 a. Convert the following second order analog filter with system transfer function $H(s) = \frac{b}{(s+a)^2 + b^2}$ into a digital filter with infinite impulse response by the use of impulse invariance mapping technique. Also find H(z) if $H_a(s) = \frac{1}{s^2 + 2s + 2}$ **(08 Marks)**

b. Explain bilinear transformation method of converting analog filter into digital filter. Show the mapping from s-plane to z-plane. Also obtain the relation between ω and Ω. **(08 Marks)**

**OR**

6 a. A digital lowpass filter is required to meet the following specifications :
(i) Monotonic pass band and stop band (ii) –3.01 dB cutoff frequency of 0.5π rad
(iii) Stopband attenuation of atleast 15 dB at 0.75π rad. Find the system function H(z). Use bilinear transformation technique. **(08 Marks)**

b. Design a second order bandpass digital Butterworth filter with passband of 200 Hz to 300 Hz and sampling frequency of 2000 Hz using bilinear transformation method. **(08 Marks)**

## Module-4

7 a. Design a digital Chebyshev type-I filter that satisfies the following constraints:

$0.8 \le |H(w)| \le 1 \quad ; \quad 0 \le w \le 0.2\pi$

$|H(w)| \le 0.2 \quad ; \quad 0.6\pi \le w \le \pi$

Use impulse invariant transformation. **(08 Marks)**

b. Design a high pass filter H(z) to be used to meets the specifications shown in Fig.Q7(b) below. The sampling rate is fixed at 1000 samples/sec. Use bilinear transformation.

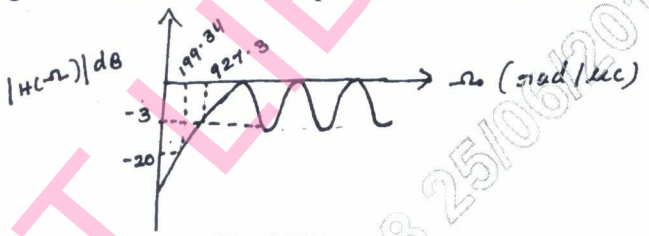


Fig.Q7(b) **(08 Marks)**

**OR**

8 a. Obtain the direct form-I and direct form-II structure for the system given by

$$H(z) = \frac{z^{-1} - 3z^{-2}}{(10 - z^{-1})(1 + 0.5z^{-1} + 0.5z^{-2})}$$ **(08 Marks)**

b. Draw the cascade form structure for the system given by

$$H(z) = \frac{\left(1 - \frac{1}{2}z^{-1}\right)}{\left(1 - \frac{1}{4}z^{-1} + \frac{1}{2}z^{-2}\right)\left(1 - \frac{1}{5}z^{-1} + \frac{1}{6}z^{-2}\right)}$$ **(04 Marks)**

c. A digital system is given by $H(z) = \frac{1 - \frac{1}{2}z^{-1}}{\left(1 - \frac{1}{3}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)}$

Obtain the parallel form structure. **(04 Marks)**

## Module-5

9 a. Explain why windows are necessary in FIR filter design. What are the different windows used in practice? Explain in brief. **(08 Marks)**

b. The desired frequency response of a lowpass filter is given by

$$H_d(w) = \begin{cases} e^{-j3w} & ; \quad |w| < 3\pi/4 \\ 0 & ; \quad 3\pi/4 < |w| < \pi \end{cases}$$

Determine the coefficients of impulse response and also determine the frequency response of the FIR filter if Hamming window is used with N = 7. **(08 Marks)**

**OR**

10 a. Design a normalized linear phase FIR filter having the phase delay of $\tau = 4$ and atleast 40 dB attenuation in the stopband. Also obtain the magnitude/frequency response of the filter **(08 Marks)**

b. Realize the system function given by $H(z) = 1 + \frac{5}{2}z^{-1} + 2z^{-2} + 2z^{-3}$ in direct form. **(04 Marks)**

c. Realize the digital filter with system function given by,

$H(z) = 1 + \frac{1}{2}z^{-1} + \frac{1}{3}z^{-2} + \frac{1}{7}z^{-3} + \frac{1}{3}z^{-4} + \frac{1}{2}z^{-5} + z^{-6}$ in linear phase form. **(04 Marks)**

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15EE64

# Sixth Semester B.E. Degree Examination, June/July 2018
## Electrical Machine Design

Time: 3 hrs. Max. Marks: 80

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**



### Module-1

1 a. What are the limitations involved, in design of electrical machines? **(08 Marks)**

b. List the insulating materials and how they classified based on thermal consideration and list the properties of insulting materials. **(08 Marks)**

**OR**

2 a. What are the advantages of modern trends in design and manufacturing technique? **(08 Marks)**

b. Distinguish between aluminum and copper wires. **(08 Marks)**

### Module-2

3 a. Discuss how specific magnetic and specific electric loading plays an important role in the design of electrical machine. **(08 Marks)**

b. A 5KW, 250V, 4pole, 1500rpm, shunt generation is designed to have a square pole face. The loadings are average flux density in the gap = 0.42 wb/$m^2$ and ampere conductors per meter is 15000. Find the main dimensions of the machine. Assume full load efficiency = 0.87 ratio of pole arc to pole pitch = 0.66. **(08 Marks)**

**OR**

4 a. With usual notations, derive output equation for a DC machine. **(06 Marks)**

b. A design is required for a 50KW, 4pole, 600rpm DC shunt generator, the full load terminal voltage being 220V, if the maximum gap density is 0.83 wb/$m^2$ and the armature ampere conductors per meter are 30000, calculate suitable dimensions of armature core to give a square pole face. Assume that the full load armature voltage drop is 3% of the rated terminal voltage and that the field current is 1% of rated full load current, ratio of pole arc to pole pitch is 0.67. **(10 Marks)**

### Module-3

5 a. What is windows space factor? Find the width of the window for the optimum output of a transformer. **(08 Marks)**

b. Calculate the core and window arc as required for a 1000KVA, 6600/400V, 50Hz 1$\phi$ core type transformer. Assume a maximum flux density of 1.25wb/$m^2$ and a current density of 2.5A/$mm^2$. Voltage/turn = 30V windows space factor = 0.32. **(08 Marks)**

OR

6 a. Derive an expression for the leakage reactance of a core type transformer with concentric coils of equal height state clearly the assumptions made. **(09 Marks)**

b. Design a suitable cooling tank with cooling tubes for a 500KVA, 6600/440V, 50Hz, 3ϕ transformer with the following data :
Distance between centre of adjacent limbs = 0.47m
Outer dia of H.V. winding = 0.44m
Height of frame 1.24m
Core loss = 3.7KW a $I^2R$ loss = 10.5KW
Temperature rise of oil should not exceed 35°C. Take dia of tube is 50mm and $l_t$ = 1.4m. The specific heat dissipation form the tank wall is 6 w/$m^2$–°C and 6.5w/$m^2$ - °C due to radiation and convection respectively. Assume that the dissipation is improved by 35% due to convection. **(07 Marks)**

## Module-4

7 a. Determine the main dimensions, number of stator slots, and the number of turns/phase of a 3.7KW, 400V, 3ϕ, 4pole, 50Hz, squirrel cage I.M to be started by a Y-Δ starter. Assume flux density in the gap = 0.45wb/$m^2$ amp conduction/meter = 23000, η = 0.85 p.F = 0.84 choose the main dimensions to give a cheap design. Winding factor 0.955, stacking factor = 0.9. **(08 Marks)**

b. Explain the factors which influence the length of air gap of 3ϕIM and write few empherical formulas for the length of air gap. **(08 Marks)**

OR

8 a. With usual notation, derive the o/p equation of a 3ϕ induction motor. **(08 Marks)**

b. A 11KW, 3ϕ. 6poles, 50Hz, 220V, star connects induction motor has 54 slots, each containing 9 conductors. Find the current in rotor bar and end rings. The number of bars is 64 η = 0.86 and pF = 0.85. Assume rotor mmf as 0.85 times stator mmf, Also find the size of each rotor bar and end ring if current density is 5A/$mm^2$. **(08 Marks)**

## Module-5

9 a. Define short circuit ratio in connection with 3ϕ synchronous generators. Explain the factors affecting by short circuit ratio. **(08 Marks)**

b. Find the main dimensions of a 2500 KVA, 187.5rpm, 50Hz, 3ϕ salient pole synchronous generator. The generator is to be vertical water wheel type. The specific magnetic loading is 0.6wb/$m^2$. And specific electric loading is 34,000 Ac/m, use circular poles with ratio of core length to pole pitch = 0.65. Specify the type of pole construction used if the run away speed is about two times the normal speed. **(08 Marks)**

OR

10 a. Discuss any five factors to be considered in selection of number of slots in sync. Machines. **(08 Marks)**

b. What are steps involved, in design of field windings of a synchronous machine? **(08 Marks)**

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CBCS SCHEME

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15EE662

# Sixth Semester B.E. Degree Examination, June/July 2018
## Sensors and Transducers

Time: 3 hrs. Max. Marks: 80

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**





### Module-1

1 a. Define transducer. What are the advantages and disadvantages of electrical transducers? **(06 Marks)**

b. Explain briefly the LVDT with neat diagram. **(04 Marks)**

c. A parallel plate capacitive transducer uses plates of area 250mm$^2$ which are separated by a distance 0.2mm.

i) Calculate the value of capacitance when the dielectric is air having a permittivity of $8.85 \times 10^{-12}$F/m

ii) Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18mm. Also calculate the ratio of per unit change of capacitance to per unit change of displacement

iii) If a mica sheet 0.01mm thick is inserted in the gap, calculate the value of original capacitance and change in capacitance for the same displacement. Also calculate the ratio of per unit change of capacitance to per unit change in displacement. The dielectric constant of mica is 8. **(06 Marks)**

**OR**

2 a. Explain the following terms : i) Sensitivity ii) Linearity iii) Resolution iv) Hysteresis v) Accuracy vi) Repeatability. **(06 Marks)**

b. The resistivity of semiconductor material was known to be 0.00912Ωm at room temperature. The flux density in the hall model was 0.48Wb/m$^2$. Calculate the hall angle for a hall co-efficient of $3.55 \times 10^{-4}$m$^3$/c. **(04 Marks)**

c. Explain the followings with neat diagram :

i) photoemissive cell

ii) photoconductive cell. **(06 Marks)**

### Module-2

3 a. What is strain gauge? Explain briefly the followings with neat diagram.

i) Foil type strain gauge ii) Semiconductor strain gauge. **(07 Marks)**

b. A simple electrical strain gauge of resistance 120Ω and having a gauge factor of 2 is bounded to steel having an elastic limit stress of 400MN/m$^2$ and modulus of elasticity is 200GN/m$^2$. Calculate the change in resistance,

i) due to a change in stress equal to $\frac{1}{10}$ of the elastic range

ii) due to change of temperature of 20°C if the material is advance alloy. The resistance temperature co-efficient of advance alloy is $20 \times 10^{-6}$/°C. **(05 Marks)**

c. Define load cell. Explain briefly hydraulic load cell. **(04 Marks)**

OR

4 a. Explain the followings with neat diagram :
i) Eddy current proximity sensor
ii) Pneumatic sensor. **(08 Marks)**

b. Define digital encoder. Explain various types of digital codes with an example. **(08 Marks)**

## Module-3

5 a. Explain the components of a general measurement system with block diagram. **(04 Marks)**

b. Explain briefly DC and AC signal conditioning system. **(06 Marks)**

c. State the characteristics of an ideal Op-Amp. Explain the followings :
i) Buffer amplifier
ii) Differential amplifier. **(06 Marks)**

OR

6 a. What is a data acquisition system? Explain analog data acquisition system with suitable block diagram. **(04 Marks)**

b. Explain single channel data acquisition system and multichannel analog multiplexed data equation system with neat diagram **(06 Marks)**

c. Explain briefly the followings :
i) Successive approximation analog to digital converter
ii) R–2R loaded digital to analog converter. **(06 Marks)**

## Module-4

7 a. Define "data transmission" and "Telemetry". Explain pneumatic transmission with diagram. **(04 Marks)**

b. Explain briefly the following :
i) Voltage telemetering system
ii) Current telemetering system. **(08 Marks)**

c. Explain amplitude modulation. **(04 Marks)**

OR

8 a. Define the following terms :
i) Pressure ii) Atmospheric pressure iii) Gauge pressure iv) Absolute pressure v) Static pressure. **(05 Marks)**

b. Describe the construction and working of a "Hot-Filament Ionization" gauge. **(05 Marks)**

c. Describe the construction and working of "Dead Weight Tester". **(06 Marks)**

## Module-5

9 a. What is temperature? How are temperature measuring instruments classified? **(07 Marks)**

b. Give a comparison between "Thermistor" and "Metal Resistor". **(04 Marks)**

c. Explain briefly the working of radiation pyrometer. **(05 Marks)**

OR

10 a. Explain with a neat sketch the working of electromagnetic flow meter. **(06 Marks)**

b. Describe the following with neat diagram :
i) Photoelectric Tachometer
ii) DC Tachometer. **(06 Marks)**

c. Explain the liquid level measurement using laser. **(04 Marks)**