AIKTC/KRRC/SoET/ACKN/QUES/2018-19/ **Date:** _____

School: SoET-CBCS **Branch:** ELECT. ENGG. **SEM:** VI

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Protection and Switchgear Engineering	EEC601		✓	02
2	Electrical Machines - IV	EEC602		✓	02
3	Signal processing	EEC603		✓	02
4	Microcontroller and its Applications	EEC604		✓	02
5	Control System - II	EEC605		✓	02
6	Department Level Optional Course-II Micro-grid	EEC606		✓	02

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

TE Sem-VI - Electrical - Choice Based

10/5/1

Paper / Subject Code: 88921 / Protection and Switchgear Engineering

(3 Hours) **Total Marks - 80**

i) Question No. 1 is compulsory.
ii) Attempt any three questions from remaining.
iii) Assume suitable data if necessary (mention the same).
iv) Figures to the right indicate full marks.

Q.1 Attempt **any four.** [05*04]
A) List the desirable qualities of protection scheme & explain any two qualities in details.
B) Explain the time grading protection for radial feeder.
C) Explain the advantages & disadvantages of static relays.
D) Explain pantograph type isolator.
E) Explain different methods of arc interruption.
F) Explain construction & working principle of bulk oil circuit breaker.

Q.2
A) Explain the protection scheme of induction motor against single phasing [10]
B) Explain restricted earth fault (REF) protection for alternator. [10]

Q.3
A) Explain construction & working principle of SF6 circuit breaker. [10]
B) Explain construction & working principle of HRC fuse. [10]

Q.4
A) Explain construction & working principle of induction disc relay. [10]
B) Differentiate between static & electromagnetic relay. [10]

Q.5
A) Explain percentage differential protection scheme for star-delta connected transformer. [10]
B) Explain the differential protection scheme provided for bus zones. [10]

Q.6 Write a note on **any two** [10*2]
A) Substation layout.
B) Numerical relay.
C) Phase comparison carrier current protection.

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TE - Sem - VI - Choice Based - Electrical 16/5/19

Paper / Subject Code: 88922 / Electrical Machines-IV

(3 Hours) **(Maximum Marks 80)**

Note:-

1. Q.1 is compulsory
2. Solve ANY THREE questions out of remaining.
3. ASSUME SUITABLE DATA wherever necessary.

Q1. (20)

a) Explain the operating principle of an alternator.

b) Explain operating principle of BLDC.

c) Define and explain power angle characteristics of salient pole synchronous machine.

d) What is meant by short pitched coil and what is the effect of using short pitched coil.

Q.2 (20)

a) A 220V, 50 Hz, 6 pole star connected alternator with ohmic resistance of 0.06 ohm per phase, gave following test results,

Field current A (If)	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.8	2.2	2.6	3.0	3.4
OC voltage in V (Ef)	29	58	87	116	146	172	194	232	261.5	284	300	310
Zpf terminal voltage in V	----	----	----	----	----	0	29	88	140	177	208	230

Find the regulation at full load current of 40A at pf of 0.8 lag by ZPF method.

b) Explain MMF and New ASA method to find regulation of an alternator.

Q.3 (20)

a) Explain Blondel's two reaction theory in detail.

b) A 125MVA, 3 phase, star connected 11KV, 4 pole, 50Hzsynchronous motor has a reactance of 0.15pu and negligible armature resistance. Calculate the synchronizing power per mechanical degree when it supplies full load at 11KV and 0.8 pf lead.

Q.4 (20)

a) Explain microprocessor based control scheme of BLDC motor (Block diagram and flow chart).

b) A 3 phase, 50Hz, 2 pole, star connected turbo alternator has 54 slots with 4 conductors per slot. The pitch of the coil is 2 slots less than the pole pitch. If the machine gives 3300V between lines on open circuit with sinusoidal flux distribution, determine the useful flux per pole.

Q.5 (20)

a) Explain the effect of change in excitation and mechanical power on performance of synchronous motor.

b) Explain starting methods of synchronous motors.

Q. 6 (20)

a) Write a short note on excitation circles and power circles.

b) Explain hunting in synchronous motors.

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(65) TE - sem - VI - choice Based - Electrical 22/5/19

Paper / Subject Code: 88923 / Signal Processing

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

N.B.
1) Question No.1 is compulsory.
2) Attempt any three from remaining questions.
3) Figures to right indicate full marks.
4) Assume suitable data if necessary.

Q1 Solve any **Five** Questions. 20

(a) Define periodic and non periodic signals and check the periodicity of signal $x(n) = \left(\sin\frac{2\pi n}{3} + \cos\frac{2\pi n}{5}\right)$. Find its fundamental period if the signal is periodic. 5

(b) Check whether the system $y(n) = a^n x(n)$ is static/dynamic, linear/ nonlinear and Time variant/ Time Invariant. 5

(c) The transfer function of LTI system is $H(Z) = \frac{z-1}{(z-2)(z+3)}$ Determine the impulse response. 5

(d) Find the 4-point DFT of x (n) = {1, -2, 3, 2} using matrix method. 5

(e) Compare analog and digital filters and state requirement of digital filter to be stable and causal. 5

(f) Determine whether the system $H(Z) = \frac{1+2z^{-1}}{1+\frac{6}{5}z^{-1}+\frac{9}{25}z^{-2}}$ is both Causal and Stable. 5

Q 2(a) Sketch the signal $x(n) = 2u(t+2) - 2u(t-3)$ 5

(b) Find even and odd components of signal $x(n) = \{5, 4, 3, 2, 1\}$ 5

(c) Find Z-transform of following signals. 10

i. $x(n) = 2^n u(n-2)$

ii. $x(n) = \left(\frac{1}{2}\right)^n u(n) * \left(\frac{1}{4}\right)^n u(n)$

3.(a) If DFT of $\{x(n)\} = X(k) = \{4, -j2, 0, j2\}$, using properties of DFT, find 10

i. DFT x(n-2)

ii. DFT x(-n)

iii. DFT $x^*(n)$

iv. DFT $x^2(n)$

v. DFT x(n) * x(n)

(b) Find the inverse Z-transform of $X(Z) = \frac{3z^{-1}}{(1-z^{-1})(1-2z^{-1})}$ *if* 10

a. ROC $|Z| > 2$
b. ROC $|Z| < 1$
c. ROC $1 < |Z| < 2$

4.(a) Find the 8-point DFT by radix-2, DIT FFT algorithm. 10
$x(n) = \{2, 1, 2, 1, 2, 1, 2, 1\}$

(b) Determine the response of LTI system governed by the equation. 10
$y(n) - 0.5y(n-1) = x(n)$ for the input $x(n) = 5^n u(n)$, and initial condition y (-1) =2.

5.(a) A low pass filter is to be designed with the following desired frequency response 10

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega}, & -\frac{\pi}{4} \le \omega \le \frac{\pi}{4} \\ 0, & -\frac{\pi}{4} \le \omega \le \frac{\pi}{4} \end{cases}$$

Determine the filter coefficients h(n) if the window function is defined as:

$$w(n) = \begin{cases} 1, & 0 \le n \le 4 \\ 0, & otherwise \end{cases}$$

(b) A linear shift invariant system is described by the difference equation 10
$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + x(n-1)$ with y (-1) =0 and y (-2) = -1. Find the natural response of the system.

6.(a) Find DTFT of sequence $x(n) = n\left(\frac{1}{2}\right)^n u(n)$ 5

(b) Find the energy of signal $x(n) = \left(\frac{1}{2}\right)^n \quad n \ge 0$ 5
$= (3)^n \quad n < 0$

(c) Discuss the method of Bilinear transformation for Design of IIR filter. 10

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TE-sem-VI - Choice Based - Electrical 28/5/19

Paper / Subject Code: 88924 / Microcontroller and its Applications

[3 Hours] [Total Marks: 80]

N.B. 1. Question.No.1 is compulsory
2. Attempt any three from the rest.
3. Make any suitable assumption wherever required

1 Answer any four.

(a) What are the different interrupt sources? **(05)**

(b) What is timer rollover in PIC 18. What happens after rollover? **(05)**

(c) Explain status register and BSR register of PIC 18. **(05)**

(d) Explain machine cycle and instruction cycle in Microcontroller. **(05)**

(e) Explain the difference between interrupt and polling? **(05)**

2. (a) Explain the memory organization (Program and Data Memory) of PIC 18 Microcontroller. **(10)**

(b) Explain the different types of instruction sets and mention two examples of each set. **(10)**

3. (a) Write a C18 program using Timer 0 to generate a square wave of 50 Hz frequency on Port B pin RB0. Use 16 bit programming technique with 128 prescaler. The internal frequency is 10 MHz. **(10)**

(b) Which are the steps taken by microcontroller when interrupt occurs and hence explain the interrupt vector. **(10)**

4. (a) Explain the SPBRG, TXSTA and RCSTA registers used in serial communication. **(10)**

(b) Explain stack and subroutine. Also explain all the instructions associated with them. **(10)**

5. (a) Draw and explain LCD interfacing with PIC 18 Microcontroller. **(10)**

(b) Write a C 18 program to send the message "University of Mumbai" to the serial port continuously whenever a switch (SW) connected to pin RB2 is on. Monitor its status and set the baud rate as follows:
If SW = 0, Baud rate = 6900
If SW = 1, Baud rate = 38400. Assume crystal frequency = 10 MHz.

6. Write a short note on any **two**
   a) Draw the interfacing diagram of seven segment LED and explain the programming technique Using PIC 18 Microcontroller.
   b) Stepper Motor interfacing with PIC 18 Microcontroller.
   c) ADC interfacing with PIC 18 Microcontroller.

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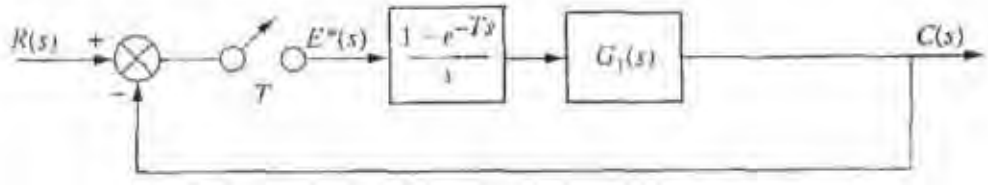
3/6/19

Time : 3 Hrs

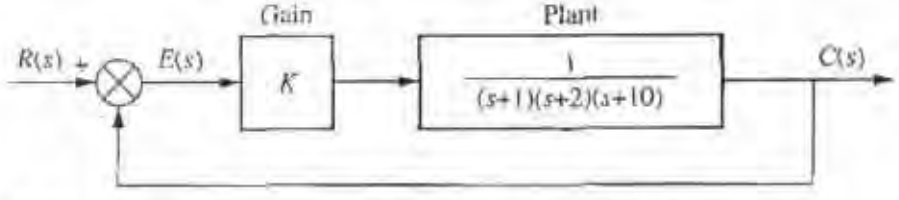
Marks : 80

Note:- (1) Q no. 1 is compulsory
(2) Solve any three questions from Q. No. 2 to Q.no. 6.
(3) Assume suitable data whenever necessary

1 a) Distinguish between Cascade compensation and Feedback compensation with block diagram. (4)
1 b) Explain Ideal Integral compensator for improving Steady State Error. (4)
1 c) Explain the difference in design of Lag compensator and Lead Compensator. (4)
1 d) Derive Controllability of n^{th} order plant in state variable approach. (4)
1 e) For Step, Ramp and Parabolic inputs, find the steady-state error for the feedback control system shown in Figure if $G_1(s) = \frac{10}{S(S+1)}$ (4)



2 a) Design a Lag compensator for the system given operating with the damping ratio 0.174 which reduces the Steady State error to zero for a step input.



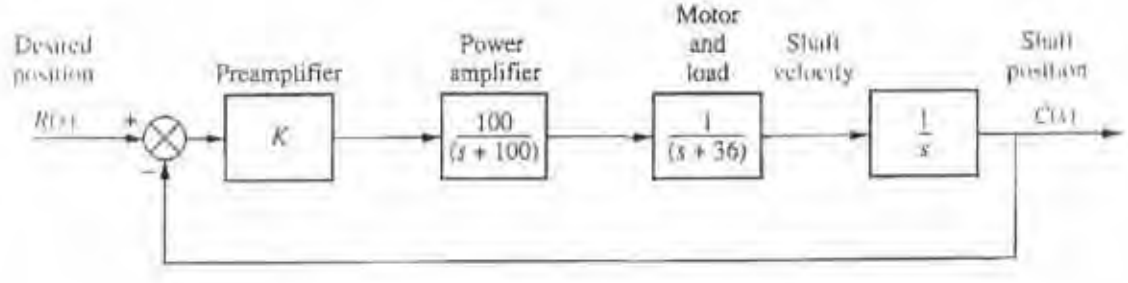
(10)

2 b) For the unity feedback system with the forward transfer function.

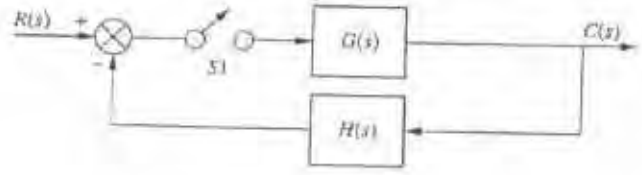
$$G(s) = \frac{K}{s(s+50)(s+120)}$$

Use frequency response techniques to find out the Gain K to yield the close loop step response with 20 % overshoot.
(10)

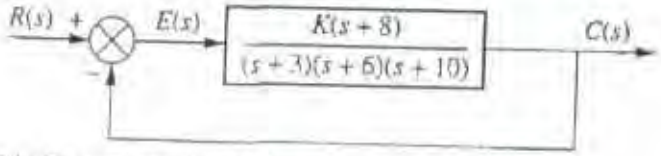
3 a) Design a lead compensator to yield the 20 % overshoot and $K_v = 40$ with the peak time of 0.1 second (10)



3 b) Find the Z transform for the system given in figure (10)



4 a) Design a PID controller so that system can operate with the peak time that is two third that of uncompensated system at 20 % overshoot and with zero steady state error for the step input. (10)



4 b) Determine whether the system is controllable (10)

$$\dot{x} = \mathbf{A}\mathbf{x} + \mathbf{B}u = \begin{bmatrix} -1 & 1 & 2 \\ 0 & -1 & 5 \\ 0 & 3 & -4 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} u$$

5 a) A unity feedback system with forward transfer function is given by (10)

$$G(s) = \frac{K}{S(S+7)}$$

is operating with a closed loop response that has 20 % overshoot. Do the following.
i)Evaluate the settling time
ii)Evaluate the steady state error for the ramp input.

5b) Find the sampled transfer function for the function given (10)

$$F(z) = \frac{0.5\,z}{(z-0.5)(z-0.7)}$$

6 a) Design an observer for the plant (10)

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

Which is represented in cascade form. The closed loop perfoemnce of the observer is governed by the chateristics polynomail as $S^3+120\,S^2+2500\,S+50.000$.

6 b) Develop the flow chart for digital compensator defined by (10)

$$G_c(z) = \frac{X(z)}{E(z)} = \frac{z+0.5}{(z^2-0.5z+0.7)}$$

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(65)

TE-Sem-VI-Choice Based-Electrical 10/6/19

Paper / Subject Code: 88927 / Elective - II Micro-grid

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

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

Q 1. Answer **any four** from the following questions. **20**

A. What is micro-grid? Explain the significance of Micro grid.
B. Explain the need of bidirectional convertor in micro-grid
C. Distinguish between micro-grid & smart grid
D. What are the different micro sources used in MG.
E. Compare AC micro-grid & DC micro-grid
F. What are the marketing models of MG.

Q 2 a) Explain the typical micro-grid structure configuration in grid connected mode. **10**

Q 2 b) What are the power quality issues in Micro grid? Suggest the suitable methods to mitigate the power quality issues. **10**

Q 3 a) Explain the micro-grid protection scheme when the fault has occurred in grid connected mode. **10**

Q 3 b) Discuss the technique to control DC-AC convertor in micro-grid. Also elaborate the invertor control issues in formation of micro-grid **10**

Q 4 a) Discuss the issues in islanded mode of operation of micro-grid **10**

Q 4 b) Explain the power electronic interface configuration for battery as an energy storage element in micro-grid **10**

Q 5 a) Discuss the centralized/ hierarchical /hybrid control methods. **10**

Q 5 b) Describe the power electronic interfaces used for micro sources in MG with neat diagrams. **10**

Q 6. Write a short note **(any two)** **10**

a) Communication protocols in micro grid. **10**
b) Event triggered & time triggered system
c)Flywheel and ultra-capacitor as ESS

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