AIKTC/KRRC/SoET/ACKN/QUES/2022-23/ **Date:** 25/01/23

School: SoET-REV. C-SCHEME **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	Power System Protection & Switchgear	EEC601		✓	
2	Microcontroller Applications	EEC602		✓	
3	Control System Design	EEC603		✓	
4	Signals and Systems	EEC604		✓	
5	Department Optional Course – 2 Special Electrical Machine	EEC605		✓	

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

Sem-VI-CBCS- Reg. 7/12/22 EE

(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 the following questions. **20**

A) Explain cut off characteristics of HRC fuse.

B) Explain current chopping phenomenon.

C) What is primary and backup protection?

D) Explain construction and working of Isolator

Q 2 a) Explain the working of induction disc relay with neat diagram. **10**

Q 2 b) Discuss various parameters of protective relay. **10**

Q 3 a) Explain with neat diagram the construction and working of SF_6 Circuit Breaker. **10**

Q 3 b) Explain resistance switching used in arc interruption. **10**

Q 4 a) Explain motor protection against single phasing with neat diagram. **10**

Q 4 b) Explain TRV and RRRV. Derive an expression for restriking voltage. **10**

Q 5 a) Explain the different Earth Fault Schemes and its application. **10**

Q 5 b) Explain current grading and time grading relay system of protection of feeder. **10**

Q 6 a) Compare static relays with electromagnetic relays. **10**

Q 6 b) Draw and explain operation of Oil Circuit Breaker. **10**

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Paper / Subject Code: 89302 / Microcontroller Applications

CE - Sem - VI - CBSG - KT

(3 Hours) [Total Marks : 80

Question No 01 is compulsory.
Attempt any Three questions from the remaining questions.
Each question carries 20 marks.
Figure to the right indicates full marks.

Q. 1. Attempt **any 04** sub-questions out of 05 sub-questions.
I] Compare the microprocessor with microcontroller. (05 marks)
II] Describe the Access Bank concept used in Pic18 microcontroller. (05 marks)
III] Explain the GIE and PEIE bits with reference to interrupt. (05 marks)
IV] Describe the Program Counter (PC) and Table Pointer (TBLPTR) registers. (05 marks)
V] Explain the Timer0 Control Register (T0CON) used in Pic18. (05 marks)

Q. 2. A] What is mean by Addressing mode? Explain the addressing modes used in Pic18 microcontroller. (10 marks)
B] Explain the memory organization (Program and Data Memory) of Pic18 Microcontroller. (10 marks)

Q. 3. A] Explain the different instruction formats used in assembly level programming of Pic18 microcontroller. (10 marks)
B] Write a C program to flash an LED connected at RB1 at a frequency of 1KHz.Use Timer0 in 16-bit mode, Crystal oscillator frequency = 10MHz and prescaler of 64. (10 marks)

Q. 4. A] Describe the various special function registers used in USART module used in Pic18 microcontroller for serial communication. (10 marks)
B] Explain the inbuilt ADC module interfacing of Pic18 microcontroller. (10 marks)

Q. 5. A] Explain the Table Read operation along with the instructions associated with it.(10 marks)
B] Explain in brief, the Capture, Compare and PWM (CCP) module of Pic18. (10 marks)

Q. 6 Write any 02 short notes.
i] LCD interfacing with Pic 18 microcontroller. (10 marks)
ii] Seven Segment LED Interfacing with Pic 18 microcontroller. (10 marks)
iii] Stepper motor interfacing with Pic 18 microcontroller (10 marks)

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2:30 pm EE-R19 13/12/22

Sem-VI-CBCS-Old KT

Duration: 3 Hours **Marks: 80**

Note:
1. Q.no. 1 is compulsory.
2. Answer any three questions from Q. No. 2 to Q. No. 6.
3. Write in legible handwriting.
4. Make any suitable assumptions wherever required.
5. Must make suitable supporting diagrams wherever desired.
6. Figure to the right indicates marks.

Q1 Each question carries five marks 20

a. Draw the bode plot of a typical lag compensator. Why it is called as a lag compensator?

b. Where a pole should be placed on z-plane to drive the steady state error of a sampled system to zero?

c. Where is the region of stability on the z-plane? Compare that with the stability region in s-plane.

d. Under what conditions would you use an observer in your state space design? Which plant representation lends itself to easier design of an observer? Why?

Q2 a. Draw the implementation for the digital compensator defined by $Gc(z)=\frac{(z+0.5)}{z^2-0.5z+0.7}$ 05

b. Given the following open-loop plant: 15
$G(s) = \frac{20(s+2)}{s(s+5)(s+7)}$ Design a controller to yield a 10% overshoot and a settling time of 2 seconds by assuming that the plant is represented in the parallel form.

Q3 a. Use frequency response methods to design a lead compensator for a unity feedback system where $G(s)=\frac{K(s+7)}{s(s+5)(s+15)}$ and the following specifications are to be met: percent overshoot=15%, Settling time=0.1sec, and Kv=1000. 10

b. Given the unity feedback system with $G(s)=\frac{K}{s(s+3)(s+9)}$ use frequency response methods to determine the value of gain K to yield a step response with a 15% overshoot. 10

Q4 a. Compare PI and Lag compensator to achieve the desired response, concerning to the pole zero locations and the transfer functions. Also develop the circuits for their realizations. 10

b. A unity feedback system with forward path transfer function $G(s)=\frac{K}{(s+1)(s+5)(s+8)}$ has 15% overshoot. Evaluate the current dominant poles using R.L and then design a PD controller to reduce the peak time by a factor of 2. 10

Q5 a. Design an integral controller to yield a 10% overshoot, 0.5 sec. settling time and zero steady state error for a step input for the following plant. 10

$$\dot{x} = \begin{bmatrix} -2 & 1 \\ 0 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u; \qquad y = [1 \quad 1]\, x$$

b. Consider the plant $G(s) = \frac{(s+2)}{(s+5)(s+6)(s+9)}$ which is represented in observer canonical form. Design an observer with a transient response described by ζ=0.6 and w_n=120. 10

Q6 a. Given a sampler and z.o.h. in cascade with $G(s) = \frac{K}{(s+5)}$ find the range of K to make the system stable. Sampling time T=0.1 second. 10

b. For the digital system with forward transfer function $G(z) = \frac{0.13(z+1)}{(z-1)(z-0.74)}$ find the static error constants and the steady state error if the inputs are u(t), t u(t) and $\frac{t^2}{2}u(t)$ for T=0.1 10

Sem – VI – CBCS – KT

13/12/22

Paper / Subject Code: 89304 / Signals and Systems

EE (R-19)

Duration – 3 Hours **Total Marks assigned to the paper- 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 the following questions. **20**
a) Define symmetric and anti-symmetric signals.
b) Summarize the properties of ROC.
c) Find the Fourier transform of $x(t) = e^{-2t} \cos 3t\, u(t)$.
d) List any three properties of DTFT.

Q 2 a) (i) Write about elementary Continuous time Signals in detail. **10**
(ii) Describe whether the following signal is periodic. If periodic determine the fundamental period.
$x(t) = 3\cos(4t) + 2\sin(\pi t)$

Q 2 b) Derive the odd and even components of the following signals. **10**
$x(t) = \sin(t) + 2\sin(t) + 2\sin 2(t)\cos(t)$
$x[n] = \{1, 0, -1, 2, 3\}$

Q 3 a) (i) Find out the Fourier transform of $x(t)=e^{-at}\, u(-t)$ **10**
(ii) Determine the Fourier series representation of the signal
$x(t) = 2+\cos(4t) + \sin(6t)$

Q 3 b) Formulate the trigonometric Fourier series over the interval (-1, 1) for the signal $x(t) = t^2$. **10**

Q 4 a) (i) Deduce the initial value of $X(z) = \frac{z+2}{(z+1)(z+2)}$ **10**

(ii) Evaluate the Z- transform of $x(n) = (2/3)^n u(n) + (-1/2)^n u(n)$.

Q 4 b) (i) Infer the Z-transform and ROC of $x[n] = 2^n u(n)+3^n u(-n-1)$. **10**
(ii) Determine the Z-transform of the sequence $x(n) = \{5,3,2,4\}$.

Q 5 a) Write short note on (i)properties of DFT (ii) Types of signals **10**

Q 5 b) Determine eight-point DFT of the following sequences using radix-2 DIT-FFT algorithm $x(n) = \{1, -1, -1, -1, 1, 1, 1, -1\}$. **10**

Q 6 a) Design a digital Butterworth filter satisfying the constraints using bilinear transformations. **10**
$0.707 \le |H(\omega)| \le 1.0;\ 0 \le \omega \le \pi/2$
$|H(\omega)| \le 0.2;\ 3\pi/4 \le \omega \le \pi.$

Q 6 b) Design an FIR filter for the ideal frequency response using Hamming window with N=7 **10**
$Hd(\omega) = \{e^{-j2\omega};\ -\pi/8 \le \omega \le \pi/8$
$0;$ otherwise.

Paper / Subject Code: 89305 / Special Electrical Machine (DLOC)

Sem-VI-CBSS-C-19-KT CC

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

NB: (1) Question **No. 1** is **compulsory**
(2) **Answer** any **THREE** questions out of the remaining **FIVE** questions.
(3) Assume suitable data if **necessary** and **justify** them
(4) **Figure** to the **right** indicates **marks**

1. (a) Explain briefly working of stepper motor stating one application. 5
   (b) Describe the closed loop control analysis of brushless DC motor. 5
   (c) Draw the power converter circuit of permanent magnet synchronous motor. 5
   (d) Explain the current control scheme of switched reluctance motor in detail. 5

2. (a) Describe in detail the construction and working of variable reluctance stepper motor. 10
   (b) With a neat sketch, explain the microprocessor-based speed control of Stepper motor. 10

3. (a) State and describe the control strategies preferred for switched reluctance motor on the basis of the speed range. 10
   (b) Compare any three converter topologies for a three phase switched reluctance motor stating clearly its merits and demerits. 10

4. (a) Explain the construction of BLDC motor. Also compare conventional DC motor and BLDC motor. 10
   (b) With a neat block diagram, explain the microprocessor-based speed control of BLDC motor. 10

5. (a) With necessary phasor diagram, describe the torque speed characteristics of PMSM. 10
   (b) With a neat block diagram, explain the closed loop speed control of PMSM. 10

6. (a) Write down the principle of operation of a Synchronous Reluctance Motor. 10
   (b) Compare the performance of synchronous reluctance motor with switched reluctance motor. 10

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2/2022

Write the output for the following code.	4M

```
#include<stdio.h>
void main()
{
        int i;
        for(i=0; i<5; i++);
            printf("%d",i);
        printf("\nhi");
}
```