AIKTC/KRRC/SoET/ACKN/QUES/2021-22/ **Date:** _____

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 Electric Machines	EEC605		✓	

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

Electrical Engg
Sub: RSPS, R-19
Sem: VI 18/05/2022

University of Mumbai

Examinations Summer 2022

Time: 2hour 30 minutes Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	An isolator is installed _____.
Option A:	to operate the relay of C.B.
Option B:	as substitute for C.B.
Option C:	generally, on one side of a C.B.
Option D:	generally, on both sides of a C.B.
2.	Circuit breakers usually operate under _____.
Option A:	steady short circuit current
Option B:	sub transient state of short circuit current
Option C:	transient state of short circuit current
Option D:	Zero sequence current
3.	The relay operating speed does not depend upon _____.
Option A:	The spring tension
Option B:	The rate of flux built up
Option C:	Armature core airgap
Option D:	Area of the moving sector
4.	Plug setting of electromagnetic relay can be altered by varying _____.
Option A:	Number of amperes turns
Option B:	Air gap of magnetic path
Option C:	Adjustable back stop
Option D:	Time setting
5.	A single phasing relays are used for protection of _____.
Option A:	Single phase motor only
Option B:	Two phase motor only
Option C:	Two phase motors running in parallel
Option D:	Three phase motor only
6.	Carrier current protection scheme is normally used for _____.
Option A:	HV transmission only
Option B:	HV cables only
Option C:	HV transmission and cables
Option D:	LV transmission only
7.	The Overhead ground wires are used to protect a transmission line against _____.
Option A:	Line to ground faults
Option B:	Arcing earths
Option C:	Voltage surges due to direct lightning stroke
Option D:	High-voltage oscillations due to switching

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8.	The Phase comparison relay has merit that _____.
Option A:	Its operation does not depend upon the direction of power flow
Option B:	It can operate even for low value of fault current
Option C:	Correct relay action can be obtained by using series capacitor on the line
Option D:	It can be used to compare scalar quantities as well.
9.	The number of pilot wires required for protecting 3 phase transmission lines using Translay system of protection is _____.
Option A:	6
Option B:	4
Option C:	3
Option D:	2
10.	The _____ relay is used for phase fault on short transmission line.
Option A:	Induction type
Option B:	Reactance
Option C:	Impedance.
Option D:	Admittance

Q2. (20 Marks)	**Solve any Two Questions out of Three 10 marks each**
A	Draw and explain construction and working of Pantograph Isolators.
B	Draw and explain construction, working and operating characteristic of HRC Fuse.
C	Explain working principle of induction type of relays and its characteristics.
Q3. (20 Marks)	**Solve any Two Questions out of Three 10 marks each**
A	Explain the phenomenon of current chopping and its effect in the circuit breakers.
B	Explain Numerical Relay in detail.
C	Explain phase comparison carrier current protection
Q4. (20 Marks)	**Solve any Two Questions out of Three 10 marks each**
A	Explain REF protection for alternator. How 100% winding is protected in an alternator?
B	Explain the operation of Harmonic restraint relay.
C	Explain the effect of power swing in distance relay.

Sub:- MA 21/05/2022
Branch :- EE
Sem :- VI

University of Mumbai

Examinations Summer 2022

Time: 2 hour 30 minutes

Max. Marks: 80 R-19

Q1. (20 Marks)	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks (02 marks each)
1.	The Access Bank of PIC18 consists of _____ and _____Registers.
Option A:	General Purpose & Bank select
Option B:	General Purpose & File Select
Option C:	General Purpose & Working
Option D:	General Purpose & Special Function
2.	RLCF F, d, a For the given instruction syntax, which STATUS flag/s will get affected
Option A:	Z
Option B:	Z, N
Option C:	Z, N, C
Option D:	N
3.	PIC18 microcontroller has _____size of address bus and _____size of data bus to access Data RAM.
Option A:	8 bit, 8 bit
Option B:	12 bit, 8 bit
Option C:	16 bit, 8 bit
Option D:	21 bit, 16 bit
4.	MOVLW 00xH, MOVWF TRISC What will happen after execution of above instructions?
Option A:	Port C will act as Input Port
Option B:	Port C will act as Output Port.
Option C:	Port C will Load WREG register with 00H value
Option D:	WREG register will get loaded with the content in PORTC register.
5.	To access the program code from program memory, _____pointer is used and to access the data from program memory, pointer is used.
Option A:	Program Counter, Table Pointer
Option B:	Program Counter, File Select Register
Option C:	Table Pointer, File Select Register
Option D:	Table Pointer, Program counter
6.	The Analog to Digital converter of Pic18F is a _____ bit converter.
Option A:	4
Option B:	8
Option C:	10
Option D:	12
7.	To write the Command Word to Command Register of LCD, select the appropriate status to be maintained at RS and RW pin respectively.
Option A:	RS =0, RW = 0
Option B:	RS =0, RW = 1
Option C:	RS =1, RW = 0

Option D:	RS =1, RW = 1
8.	Write an instruction to Start the analog to digital conversion in ADC module of Pic18 microcontroller.
Option A:	ADCON0bits.ADON=0;
Option B:	ADCON0bits.ADON=1;
Option C:	ADCON0bits.GO=0;
Option D:	ADCON0bits.GO=1;
9.	If the SPBRG register of serial communication is loaded with 03H and the clock frequency (Fosc) is 10MHz. Select the most appropriate Baud are set by serial communication module.
Option A:	2400
Option B:	9600
Option C:	19200
Option D:	38400
10.	In PWM mode of CCP module, the associated CCP pin is set as _____.
Option A:	Input pin
Option B:	Output pin
Option C:	Clock input pin for timer
Option D:	Interrupt pin

Q2 (20 Marks)	**Solve any Four out of Six questions** **(05 marks each)**
A.	Explain the Status register used in Pic18 microcontroller and also explain its significance.
B	Write the differences between microprocessor and microcontroller.
C	Describe the Access Bank concept used in Pic18 microcontroller.
D	Explain the structure of Timer0 control register (T0CON) used in Timer0.
E	Explain the GIE and PEIE bits with reference to interrupt.
F	Explain stack and subroutine. Explain any one instruction associated with that.

Q3 (20 Marks)	**Solve any Two Questions out of Three** **(10 marks each)**
A	What is mean by addressing mode? Explain the different addressing modes used in pic18 microcontroller.
B	Describe the various special function registers used in USART module used in Pic18 microcontroller for serial communication.
C	Draw the block diagram of ADC module used in Pic18 microcontroller and hence explain the control registers associated with the same.

Q4 (20 Marks)	**Solve any Two Questions out of Three** **(10 marks each)**
A	Write a C program for Timer0 to generate a square wave of 100 Hz frequency at RB7 pin. Assume the oscillatory frequency (Fosc) as 10 MHz. Operate Timer0 in 16 bit mode with a prescaler of 128.
B	Describe the Compare, Capture and PWM (CCP) module of Pic18 microcontroller.
C	Write a short note on Stepper motor interfacing with Pic18 microcontroller.

Q.P code: 93652

24/05/2022

University of Mumbai

Program: **Electrical**
Curriculum Scheme: Rev2019
Examination: TE Semester VI
Course Code: EEC603 and Course Name: Control System Design

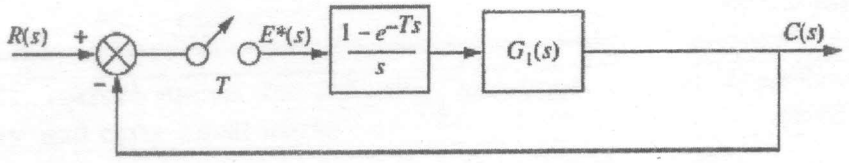
Time: 2 and half hour | Max. Marks: 80

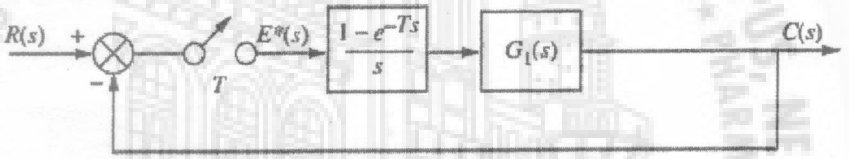
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks (20Marks)**
1.	Which of the following system provides excellent steady state response
Option A:	Lead compensator
Option B:	Lag compensator
Option C:	Proportional + Differential controller
Option D:	Proportional + Integral controller
2.	The state feedback controller
Option A:	Increases the steady state error
Option B:	Decreases the steady state error
Option C:	Improves the transient behavior
Option D:	Improves both steady state and transient behaviour
3.	Where on the s-plane should a pole be placed to drive the steady-state error of a system to zero?
Option A:	At origin
Option B:	s=1
Option C:	s<1
Option D:	s>1
4.	Pole of a first order compensator is on the right side of the compensator zero on s-plane. Identify the compensator
Option A:	Lead compensator
Option B:	Lag compensator
Option C:	Lag-Lead compensator
Option D:	Lag or Lead compensator
5.	The objective of the continuous compensator design is to reduce the settling time by a factor of 2 with the same damping ratio. One of the dominant closed loop poles of the system with the required damping ratio is at -5-j4. Then the new peak time is
Option A:	8sec
Option B:	10sec
Option C:	0.31sec
Option D:	0.39sec
6.	What is the steady state error for the digital system with forward transfer function $G(z)=\frac{0.13(z+2)}{(z-1)(z-0.6)}$ with ramp input, if the sampling time T=0.5sec ?
Option A:	0

Option B:	2.12
Option C:	1.95
Option D:	2.05
7.	During the lag compensator design with Bode-plot it is observed that the frequency corresponds to $PM_{required}$ -180 +10 is 29rad/sec. At this frequency, magnitude of the uncompensated system is 22dB. Then the lag compensator is,
Option A:	$\frac{0.079(s+2.9)}{(s+0.23)}$
Option B:	$\frac{0.018(s+2.9)}{(s+0.052)}$
Option C:	$\frac{0.079(s+0.018)}{(s+2.9)}$
Option D:	$\frac{0.018(s+0.079)}{(s+2.9)}$
8.	Which of the following system is controllable but not observable?
Option A:	$A=\begin{bmatrix}-5 & 0\\ 0 & -2\end{bmatrix}$ $B=\begin{bmatrix}2\\ 0\end{bmatrix}$ and C=[1 5]
Option B:	$A=\begin{bmatrix}-5 & 0\\ 0 & -2\end{bmatrix}$ $B=\begin{bmatrix}2\\ -3\end{bmatrix}$ and C=[0 5]
Option C:	$A=\begin{bmatrix}-5 & 0\\ 0 & -2\end{bmatrix}$ $B=\begin{bmatrix}0\\ -3\end{bmatrix}$ and C=[0 5]
Option D:	$A=\begin{bmatrix}-5 & 0\\ 0 & -2\end{bmatrix}$ $B=\begin{bmatrix}2\\ -3\end{bmatrix}$ and C=[2 5]
9.	A pulsed transfer function in the forward path of the unity feedback system is $G(z)=\frac{K(z+3)}{(z-0.2)(z-0.5)}$. What is the range of K for which the system is stable?
Option A:	0<K<0.25
Option B:	0<K<0.5
Option C:	0<K<0.3
Option D:	0<K<0.125
10.	One of the dominant closed loop poles of a digital system in z-domain is at 0.4+j0.5. What is the settling time with the sampling time T=0.25?
Option A:	4.42 sec
Option B:	2.24 sec
Option C:	1.26sec
Option D:	2.83sec

PART-B

Q2	Solve any Two Questions out of Three — 10 marks each
A	Given the negative unity feedback system $G(s)=\frac{K}{s(s+8)(s+15)}$ use frequency response methods to determine the value of gain, K, to yield a step response with a 20% overshoot.
B	Consider the following transfer function: $G(s)=\frac{(s+6)}{(s+3)(s+8)(s+10)}$. If the system is represented in cascade form, design a controller to yield a closed loop response of 10% overshoot with a settling time of 1 sec. Design the controller

	by first transforming the plant to phase variables. Draw the plant representation in cascade form with the controller gains.
C	For step, ramp, and parabolic inputs, find the steady-state error for the feedback control system shown in Figure with $G_1(s) = \frac{10}{s(s+1)}$. Consider T=0.1 sec. 

Q3	Solve any Two Questions out of Three 10 marks each
A	Consider a unity feedback system with feed forward transfer function $G(s) = \frac{K(s+6)}{(s+2)(s+3)(s+5)}$. It is operating with a dominant-pole damping ratio of 0.707. Using Root-locus, design a PD controller so that the settling time is reduced by a factor of 2. Draw the compensated Root-locus and verify the performance.
B	Find the range of sampling interval, T, that will keep the following system with $G_1(s) = \frac{10}{(s+1)}$ stable. 
C	Given the plant $x' = \begin{bmatrix} -1 & 1 \\ 0 & 2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ y= [1 1]x Design an integral controller to yield a 15% overshoot, 0.6 second settling time, and zero steady-state error for a step input.

Q4	Solve any Two Questions out of Three 10 marks each
A	Given $T(z) = \frac{N(z)}{D(z)}$ where $D(z) = z^4 + z^3 - 2z + 0.5$, use the Routh- Hurwitz criterion to find the number of z-plane poles of T(z) inside, outside and on the unit circle. Is the system stable?
B	For a unity feedback system with $G(s) = \frac{K}{s(s+10)(s+200)}$ design a lag compensator using Bode-plot so that the system operates with a 20% overshoot and a static error constant of 100. Draw the compensated Bode-plot to verify the performance after the design.
C	Consider the plant $G(s) = \frac{(s+2)}{(s+5)(s+6)(s+9)}$ which is represented in parallel form. Design an observer with a transient response described by ζ=0.6 and w_n=120. Place the observer third pole 10 times as far from the imaginary axis as the observer dominant poles. Transform the plant to observer canonical form for the design.

Sub: SS

Sem VI CBCS - C-19

Q.Pcode : 93937

27/05/2022

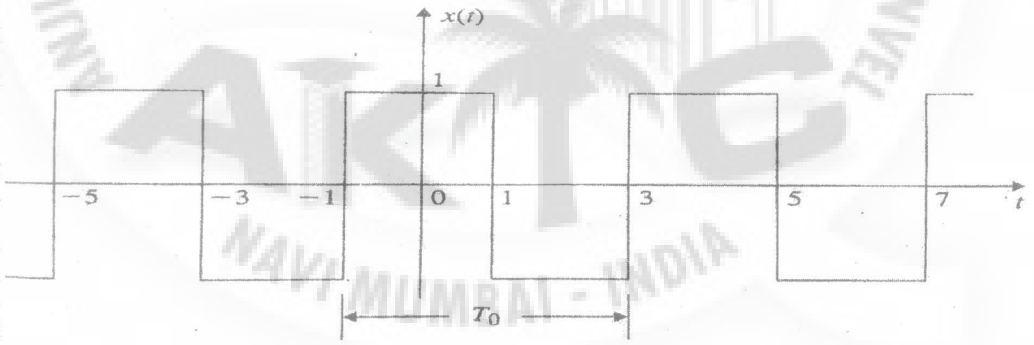
EE

University of Mumbai
Examinations Summer 2022

Time: 2 hour 30 minutes **Max. Marks: 80**

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. (2 marks each) (20 Marks)**
1.	If x (-t) = x (t) then the signal is said to be
Option A:	Even signal
Option B:	Odd signal
Option C:	Periodic signal
Option D:	Non periodic signal
2.	Given a unit step signal u(n), the time difference [u(n)-u(n-1)] is equal to
Option A:	a unit impulse signal
Option B:	another step signal
Option C:	a unit ramp signal
Option D:	None of there
3.	The unit impulse is defined as
Option A:	$\delta(t) = \infty; t = 0$
Option B:	$\delta(t) = \infty; t = 0$ $=0; t \neq 0$
Option C:	$\delta(t) = \infty; t = 0$ and $\int_{-\infty}^{\infty} \delta(t)dt = A$
Option D:	$\delta(t) = \infty; t = 0$ $=0; t \neq 0$ And $\int_{-\infty}^{\infty} \delta(t)dt = 1$
4.	A periodic signal x(n) of period N1 is added to another periodic signal of period N2 . Then the period of the resulting signal is always
Option A:	N1+N2
Option B:	N1N2
Option C:	LCM of N1and N2
Option D:	GCD of N1and N2
5.	What does the zero-state response of the system means?
Option A:	Response of the system when initial state of the system is zero
Option B:	Response of the system due to input alone
Option C:	Response of the system due to input alone when initial state of the system is zero
Option D:	Response of the system due to input alone when initial state is neglected
6.	For H(z) the ROC of the stable LTI system is given as
Option A:	Entire z-plane, except at z=0
Option B:	Entire z-plane, except at z=∞
Option C:	Contain unit circle
Option D:	ROC does not exist
7.	An LTI system is said to be causal when
Option A:	the value of an impulse response is zero for all negative values of time

Option B:	the value of an impulse response is unity for all negative values of time
Option C:	the value of an impulse response is infinity for all negative values of time
Option D:	the value of an impulse response is negative for all negative values of time
8.	A LTI system is _____ if ∑h(n)<infinity. Here the summation is absolutely summable
Option A:	stable
Option B:	causal
Option C:	unstable
Option D:	time invariant
9.	The IIR filter designing involves
Option A:	Designing of digital filter into digital domain and transforming into analog domain
Option B:	Designing of analog filter into digital domain and transforming into analog domain
Option C:	Designing of digital filter into analog domain and transforming into digital domain
Option D:	Designing of analog filter into analog domain and transforming into digital domain
10.	A filter is said to be linear phase filter if the phase delay and group delay are _____
Option A:	High
Option B:	Moderate
Option C:	Low
Option D:	Constant

Q2.	**Solve any Four out of Six. (5 marks each)** **(20 Marks)**
A	Determine Even and Odd parts of the signal x(n)={2,-2,6,-2}
B	Explain any five properties of Z transform
C	Find the Trigonometric Fourier series for the periodic signal shown in figure 
D	Find IDFT of X(K)={4,-j2, 0, j2} using DFT by matrix method.
E	State the advantages and limitations of digital filters.
F	Find the order of the IIR filter for a given specification using Bilinear Transformation method. $0.8 \leq \lvert H(e^{j\omega})\rvert \leq 1$ ---------- $0 \leq \omega \leq 0.2\,\pi$ $\lvert H(e^{j\omega})\rvert \leq 0.2$ ---------- $0.6\pi \leq \omega \leq \pi$

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Q3.	**Solve any Two Questions out of Three. (10 marks each)** **(20 Marks)**
A	Determine the impulse response and step response of the causal system given below and discuss on stability $y(n) - y(n-1) - 2y(n-2) = x(n-1) + 2x(n-2)$
B	Find DFT of the sequence x(n)={ 1,2,3,4,4,3,2,1} using radix-2 DIT FFT algorithm
C	Discuss the design procedure for low pass digital Butterworth IIR filter.

Q4.	**(20 Marks)**
A	**Solve any Two. (5 marks each)**
i.	Check whether the system y(n)=x(n) x(n-2) is 1.Static or dynamic 2.Linear or nonlinear 3.Causal or non-causal, and 4.Shift-invariant or shift-variant
ii.	Design an FIR digital filter to approximate an ideal low pass filter with passband gain of unity, cut off frequency of 850 Hzs and working at a sampling frequency of fs=5000 Hz. The length of the impulse response should be 5. Use a rectangular window.
iii.	Discuss Rectangular and Hamming windows used to design FIR filters.
B	**Solve any One. (10 marks each)**
i.	Determine the inverse Z-transform of $X(Z) = \frac{z}{3z^2-4z+1}$ if the ROC are: 1. $z > 1$, 2. $z < \frac{1}{3}$ 3. $\frac{1}{3} < z < 1$
ii.	A linear shift invariant system is described by the difference equation, $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + x(n-1)$ with $y(-1) = 0$ and $y(-2) = -1$. Find the natural response of the system

Branch: EE
Sem: VI
31/05/2022

University of Mumbai

Examinations Summer 2022

Subject: Special Electrical Machines

Time: 2hour 30 minutes | Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	**In BLDC motor field winding is kept on _____**
Option A:	Stator
Option B:	Rotor
Option C:	Can be placed anywhere
Option D:	Absent
2.	**The speed-torque characteristics of the BLDC motor are similar to that of**
Option A:	DC Shunt Motor
Option B:	DC Series Motor
Option C:	Induction Motor
Option D:	Compound Motor
3.	**The stator of reluctance motor resembles**
Option A:	Induction Motor
Option B:	DC motor
Option C:	Synchronous Motor
Option D:	Compound Motor
4.	**Which of the following motor rotates in discrete angular steps?**
Option A:	Servo motor
Option B:	DC motor
Option C:	Stepper motor
Option D:	Linear Induction Motor (LIM)
5.	**Stepper motor runs in response to**
Option A:	a programmed sequence of input electrical pulses.
Option B:	Pulse Width Modulation (PWM).
Option C:	Feedback signal
Option D:	Pulse Position Modulation (PPM).
6.	**A hybrid stepper motor has stator and rotor teeth 40 and 50 respectively, the step angle is _____.**
Option A:	0.9 degree
Option B:	4 degree
Option C:	0.8 degree
Option D:	1.8 degree
7	**The direction of rotation of Switch reluctance Motor can be reversed by**
Option A:	Changing the supply terminal
Option B:	Changing the Rotor terminal wire
Option C:	Changing the Stator terminal wire
Option D:	Rotation can't be reversed

8.	**A variable reluctance stepper motor has 8 main poles which have 5 teeth each. If rotor has 60 teeth, calculate the stepping angle.**
Option A:	0.9 degree
Option B:	3 degree
Option C:	0.5 degree
Option D:	1.8 degree
9.	**The secondary of a linear induction motor normally consists of a**
Option A:	Concentrated single phase winding.
Option B:	Distributed single phase winding.
Option C:	Solid conducting plate.
Option D:	Distributed three phase winding.
10.	**Which of the following mode of operation is possible in switched reluctance motor?**
Option A:	One quadrant
Option B:	Two quadrant
Option C:	Three quadrant
Option D:	Four quadrant

Q2	Solve any Two Questions out of Three 10 marks each
A	Explain the construction and working of a Permanent Magnet Stepper Motor.
B	With necessary block diagram explain the DSP-based control of BLDC motor.
C	What are the features of Permanent Magnet Synchronous Motor? What are its advantages and disadvantages

Q3	Solve any Two Questions out of Three 10 marks each
A	A stepper motor has a step angle of 1.8°. Find (a) Resolution (b) Number of steps required for 50 revolutions and (c) Shaft speed if the stepping frequency is 5000 pulse/sec.
B	What is the Switched Reluctance motor with necessary diagram? explain the construction and working of switched Reluctance motor.
C	Compare BLDC motor and Permanent Magnet Synchronous Motor(PMSM)

Q4.	Solve any Two Questions out of Three 10 marks each
A	Derive the torque equation of synchronous Reluctance motor.
B	Explain the sensorless control of BLDC motor? What are its advantages?
C	Explain the principle of working of an linear induction motor and write down its advantages and disadvantages.

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