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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(Govt. Aided Autonomous Institute Affiliated to University of Mumbai)

Re-examination [January 2020]

Academic Year 2019 – 20 [First Half]

Program: B. Tech. Electrical Engineering

Course: Digital Signal Processing

Course Code: PE -BTE501

Semester: V

Date: 13th Jan 2020

Total Points: 100

Note: Solve any **FIVE** questions of the following. Write answers of all sub-questions together.

CO: Course Outcomes **BL:** Bloom's Taxonomy Level **PI:** Performance Indicator

Q. No.		Question	Points	CO	BL	PI
1		Design an analog lowpass filter using Butterworth, Chebyshev and inverse Chebyshev approximation to meet following specifications: $A_p \leq 1\ dB$ for $\Omega_p \leq 4\ rad/s$ and $A_s \geq 20\ dB$ for $\Omega_s \geq 8\ rad/s$.	20	4	6	1.6.1
2	A	Design a 4th order FIR filter, using rectangular window function, to approximate an ideal low-pass filter with passband gain of unity, cut-off frequency of 850 Hz and working at a sampling frequency of 5000 Hz.	10	4	6	1.5.1
	B	Design a linear phase FIR highpass filter using Hanning window function, for the specifications given below: Stopband edge = 2 kHz, Stopband attenuation ≥ 40 dB, Passband edge = 9.5 kHz, Passband attenuation < 1 dB, Sampling frequency = 25 kHz.	10	4	6	1.5.1
3	A	Determine 8-point DFT of the sequence $x(n) = \{1,2,4,8,16,32,64,128\}$ using radix-2 DIT FFT algorithm.	10	3	3	2.5.1
	B	Determine IDFT of the following sequence using radix-2 DIT-FFT algorithm: $X(k) = \begin{Bmatrix} 36, -4+j9.656, -4+j4, -4+j1.656, -4, \\ -4-j1.656, -4-j4, -4-j9.656 \end{Bmatrix}$	10	3	3	2.5.1
4	A	For the sequences $x_1(n) = \{1,1,2,2\}$ and $x_2(n) = \{1,2,3,4\}$, determine: *i.* linear convolution *ii.* circular periodic convolution using DFT / IDFT.	 02 08	3	3	1.5.1

	B	Discuss symmetry properties of DFT for a signal with following cases: *i*. real (even and odd) and *ii*. purely imaginary (even and odd).	10	2	3	1.5.1
5	*A*	Determine 8-point DFT of the sequence $x(n)=\begin{cases}1 & 0\le n\le 3\\ 0 & 4\le n\le 7\end{cases}$. Using DFT properties only determine, DFT of, $x_1(n)=\begin{cases}1 & n=0\\ 0 & 1\le n\le 4;\\ 1 & 5\le n\le 7\end{cases}$ $x_2(n)=\begin{cases}0 & 0\le n\le 1\\ 1 & 2\le n\le 5;\\ 0 & 6\le n\le 7\end{cases}$				
	B	Determine linear convolution of the following signals using convolution property of DTFT. $x_1(n)=nu(n)$ and $x_2(n)=(2)^n u(n-1)$.				
6	*A*	Derive the bilinear *z*-transformation mapping of *s*-plane poles and zeros into *z*-plane poles and zeros. Discuss the advantages and drawbacks of this mapping.	10	4	6 2	1.6.1
	B	A simple LRC notch filter has following normalized, s-plane transfer function: $$H(s)=\frac{s^2+1}{s^2+s+1}$$ Determine the transfer function of an equivalent digital filter using BLT. Assume a notch frequency of 60 Hz and sampling frequency of 960 Hz	10	4	6	1.6.1
7	*A*	Using frequency sampling method calculate the coefficients and draw realization diagram of a linear-phase FIR filter of length 15 which has a symmetric unit sample response and a frequency response that satisfies the condition, $$H\left(\frac{2\pi k}{15}\right)=\begin{cases}1, & k=0,1,2,3\\ 0.4, & k=4\\ 0, & k=5,6,7\end{cases}$$	10	4	3	1.5.1
	B	A causal system is represented by the following difference equation. $$y(n)+\frac{1}{4}y(n-1)=x(n)+\frac{1}{2}x(n-1)$$ Determine the system transfer function, impulse response and frequency response of the system. Show the magnitude and phase functions clearly.	10	2	3	1.5.1

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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

REEXAMINATION JAN. 2020

(OLD COURSE)

Program: ELECTRICAL ENGG. **Duration: 3 HOURS**

Course Code: BTE306 **Maximum Points: 100**

Course Name: POWER ELECTRONICS **Semester: V**

Instructions:

- **Solve any five questions**
- **Assume suitable data if necessary and justify the same**

SN	Questions	Points	CO	BL	PI
Q1) a)	What are the different operating regions of Silicon Controlled Rectifier (SCR)? Explain with neat (V-I characteristic) diagram.	8	2	3	1.3.1
b)	Explain the application of inverter in power factor improvement, with circuit diagram.	8	2	3	1.3.1
c)	What is natural or line commutation in rectifiers?	4	4	3	1.3.1
Q2) a)	Write short note on any of the fully controlled power electronics switch using following points (a) Principle of operation, (b)characteristics, (c)rating (d) applications	12	2	2	1.3.1
b)	Discuss the working of a single phase AC voltage controller with R-L load when its firing angle is more than the load power factor angle. Illustrate with waveforms.	8	4	2	1.3.1
Q3) a)	Derive expression of average dc voltage for the three phase full wave controlled rectifier. Assume load current is continuous & constant.	10	2	2	
b)	Explain the effect of source side inductance on three phase and single phase rectifier output.	10	2	2	

Q4)	Draw circuit diagram (3M), output phase voltages (3M), output line voltages (3M), output line currents (3M) and input voltage (2M) of voltage source inverter with star connected R load when each semiconductor switch conducts for 180^0. Derive the phase and line voltages by considering load R=1 Ω (6M). (use graph paper for input and output voltage waveforms, line current waveforms should be drawn on answer sheet)	20	4	3	1.3.1
Q5)	Draw input voltage, output voltage, input current and output current waveforms for the following circuits.				
	a) Single phase full wave bridge controlled rectifier with $\alpha=120^0$ for "RLE" continuous current load and derive average output voltage	6	2	3	1.3.1
	b) Single phase full wave bridge controlled rectifier with RLE load, $\alpha>\theta$ and $\beta<\pi$	6	2		
	c) Single phase full bridge type inverter with "L" load	2	4		
	d) Single phase half wave controlled rectifier with 'R-L' load and freewheeling diode connected across load, derive average output voltage	6	2		
Q6) a)	With the help of input voltage, output voltage, voltage across inductor, voltage across capacitor, capacitor current, inductor current, load current waveforms and assumptions made, derive critical L and critical C of the DC-DC Buck regulator.	14	3	3	1.3.1
b)	Compare CSI and VSI.	6	4	2	1.3.1
Q7) a)	Why filters are required when power electronics devices are used? Which filters are used?	8	4	3	1.3.1
b)	Write short note on 'Sinusoidal triangular pulse width modulation scheme for inverter firing.	12	4	3	1.3.1

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Munshi Nagar, Andheri (West), Mumbai – 400058.

Re- Exam January 2020

Max. Marks:**100**

Duration: **3.00 Hrs**

Class: T.Y. **B.Tech. (Electrical)** Semester: **V**

Program: **Electrical Engineering**

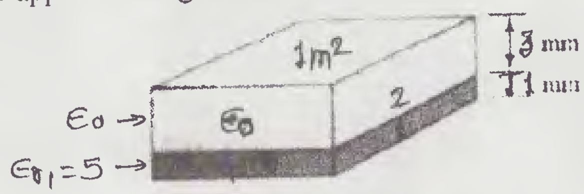
Name of the Course: **Electromagnetic fields and waves**

Course Code : **PC-BTE501**

Instructions:

1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

Que. No		Points	CO	BL
Q1 (a)	Derive an expression for magnetic field intensity due to a linear conductor of infinite length carrying current I at a distance, point P. Assume R to be the distance between conductor and point P. Use Biot-Savart's Law.	10	1	L2
(b)	Explain the term "Electrical field intensity". Derive expression for electric field intensity for an infinite line of charge	10	1	L2
Q.2(a)	Use the spherical coordinates system to find the area of the strip $\alpha \leq \theta \leq \beta$ on spherical radius 'a'. What results when $\alpha = 0$ and $\beta = \pi$?	05	01	L3
(b)	Current in the inner and outer conductors of fig.1 are uniformly distributed. Use Ampere circuital law to derive expression of magnetic field intensity (H) for $b \leq r \leq c$  Fig.: 1	05	01	L3
(c)	Given, $\overline{D} = D_m Cos(\omega t + \beta z)\overline{a_x}$ in free space. Find E, B and H. Sketch E and H at t=0	05	02	L3
(d)	Derive the work done in moving a point charge in an electric field.	05	01	L2
Q3(a)	Derive Poisson's and Laplace's equation.	08	02	L2
(b)	Identical charges of $Q(C)$ are located at the eight corners of a cube with side of $l\ meter$ show that coulombs force on each charge has magnitude $\left(\frac{3.29Q^2}{4\pi\epsilon_0 l^2}\right) N$.	06	01	L3
(c)	Explain the following term : i) Cylindrical co-ordinate system ii) Spherical co-ordinate system	06	01	L2

Q4 (a)	Use Ampere's law to obtain H due to an infinitely long straight filament of current I.	05	02	L2
(b)	Find the force on straight conductor of length 0.30 m carrying a current of 5A in the $-\bar{a}_z$ direction where the field is $3.50 \times 10^{-3}(\bar{a}_x - \bar{a}_y)\,T$	05	01	L3
(c)	Find the work done in moving a point charge $Q = -20\,\mu C$ from origin to (4,2,0) m in the field $$E = 2(x+4y)a_z + 8xa_y\,(V/m)$$ Along the path $x^2 = 8y$.	05	01	L3
(d)	Explain FEM method. How to find capacitance of two parallel plate capacitor using FEM technique?	05	03	L2
Q5 (a)	The volume in cylindrical coordinates between r = 2m and r = 4m contains a uniform charge density $\left(C/m^2\right)$. Use Gauss's law to find D in all regions.	05	01	L3
(b)	Starting with Ampere's circuital law, derive Maxwell's equation in integral form. Obtain the corresponding relation by applying the Stoke's theorem.	10	02	L2
(c)	Find the voltage across each dielectric in the capacitor shown in Fig. 2 when the applied voltage is 400 V.  Fig. 2	05	02	L3
Q.6(a)	State Maxwell's equation for static fields. Explain how they are modified for time varying electric and magnetic fields.	10	1,2	L2
(b)	Show that $$\bar{A}.\bar{B} = A_xB_x + A_yB_y + A_zB_z$$	05	01	L2
(c)	Find the capacitance of co-axial cable of length 'l', where inner conductor has radius 'a' and the outer conductor has radius 'b' (refer fig. 3)  Fig.: 3	05	02	L3
Q.7 (a)	Explain in detail relationship between **E** and **V**. Given a potential $V = 3x^2 + 4y^2$ V. Find the energy stored in the volume described by $0 \le x \le 2\,m$, $0 \le y \le 2\,m$ and $0 \le z \le 2\,m$	10	01	L3
(b)	Derive an expression for potential energy stored in static electric field of n point charges.	10	01	L2

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Munshi Nagar, Andheri (W) Mumbai – 400058

RE - EXAMINATION

ODD SEM JANUARY 2020

Program: UG | **Duration:** 3 Hour

Course Code: PC-BTE504 | **Maximum Points:** 100

Course Name: Power System - I | **Semester:** V

Notes: **1. Question No. 1 is compulsory. Solve any FOUR from remaining SIX Questions.**

2. Answer to all sub questions should be grouped together.

2. Assume suitable data wherever required and justify the same.

Q.No.	Questions	Points	CO	BL	PI
1 (a)	Explain series and shunt compensation of transmission lines.	02+02	1		
1 (b)	Define following terms: Connected load; maximum demand; demand factor; load factor; diversity factor.	05	1		
1 (c)	What are the advantages of per unit system?	03	2		
1 (d)	Define soil resistivity. Hence explain the method for measurement of earth resistance.	04	5	L-1	1.3.1
1 (e)	What is the necessity of using symmetrical components in analysis of unbalanced circuits? Show that symmetrical component transformation is power invariant.	01+03	4		

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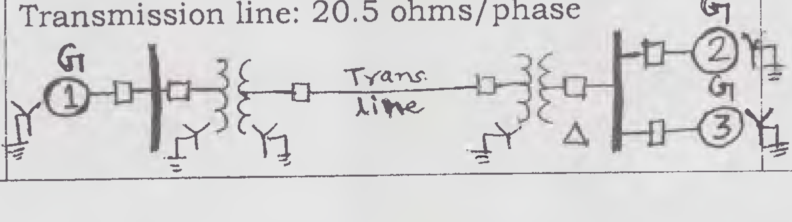
RE - EXAMINATION

ODD SEM JANUARY 2020

2 (a)	Derive the inductance of two wire (1-Φ) transmission line.	10			
2 (b)	Derive the capacitance of a 3-phase unsymmetrically spaced transmission line.	10	2	L-2	1.3.1
3 (a)	Derive A, B, C, D parameters of medium transmission line for nominal T representation. Draw phasor diagram.	08+02	3	L-2	1.3.1
3 (b)	Determine the efficiency and regulation of a 3-phase, 100 km, 50 Hz transmission line delivering 20 MW at a p.f. of 0.8 lagging and 66kV to a balanced load. The conductors are of copper, each having resistance 0.1Ω per km, 1.5cm outside diameter, spaced equilaterally 2 meters between centres. Use nominal π (pi) method for calculation.	10	3	L-3	1.3.1
4 (a)	Explain the potential distribution over a string of suspension insulators. Hence calculate the string efficiency and voltage distribution across five disc insulator with total operating voltage of 66kV line to ground. Assume factor *m*=5.	04+06	2	L-2	1.3.1
4(b)	Draw the P.U. reactance diagram for the power system shown below. Use base MVA of 30MVA and base kV of 33kV in transmission line side. Ratings of different components are as below: Generator 1: 30 MVA; 10.5 kV; X"=1.6 ohms Generator 2: 15 MVA; 6.6 kV; X"=1.2 ohms Generator 3: 25 MVA; 6.6 kV; X"=0.56 ohms Transformer 1: 15 MVA; 33/11 kV; X=15.2ohm Transformer 2: 15MVA; 33/6.2 kV; X=16 ohms Transmission line: 20.5 ohms/phase 	10	4	L-3	1.3.1

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RE - EXAMINATION

ODD SEM JANUARY 2020

Q5(a)	The line currents in amperes in phases a, b, and c respectively are 500 + j150; 100 – j600 and -300 + j600 referred to the same reference vector. Find the symmetrical component of currents.	10	4	L-2	1.3.1
Q5(b)	Explain the significance of positive, negative and zero sequence components in power system network. Hence derive the equations for symmetrical components of voltages in terms of phase voltages in case of an unbalanced power system.	03+07	4	L-2	1.3.1
Q6(a)	Derive the necessary equation to determine the fault current with fault impedance Z_f for a single line to ground fault occurring at the terminals of an unloaded alternator with it's neutral grounded through neutral impedance Z_n. Draw a diagram showing interconnection of sequence networks.	08 02	4	L-3	1.3.1
Q6(b)	A 25MVA, 13.2 kV alternator with solidly grounded neutral has a sub transient reactance of 0.25 p.u. The negative and zero sequence reactances are 0.35 p.u. and 0.1 p.u. respectively. Determine the fault current and the line to line voltages at the fault when a double line to ground fault occurs at the terminals of the alternator.	10	4	L-2	1.3.1
Q 7 (a) (b) (c) (d) (e) (f)	Write short notes on the following. **(Any Five)** The concept of National Grid. What is corona? How to reduce corona loss? Surge Impedance Loading. Tap changing in Transformers. Neutral Grounding. Design of tower footing resistance.	(4 X 5) =20	 1 2 3 4 3 5	L-3	1.3.1

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Sardar Patel College of Engineering

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Re-examination [January 2020]

Academic Year 2019 – 20 [First Half]

Program: B. Tech. Electrical Engineering
Course: Digital Signal Processing
Course Code: PE -BTE501

Semester: V
Date: 13th Jan 2020
Total Points: 100

Note: Solve any **FIVE** questions of the following. Write answers of all sub-questions together.

CO: Course Outcomes **BL:** Bloom's Taxonomy Level **PI:** Performance Indicator

Q. No.		Question	Points	CO	BL	PI
1		Design an analog lowpass filter using Butterworth, Chebyshev and inverse Chebyshev approximation to meet following specifications: $A_p \le 1\ dB$ for $\Omega_p \le 4\ rad/s$ and $A_s \ge 20\ dB$ for $\Omega_s \ge 8\ rad/s$.	20	4	6	1.6.1
2	*A*	Design a 4th order FIR filter, using rectangular window function, to approximate an ideal low-pass filter with passband gain of unity, cut-off frequency of 850 Hz and working at a sampling frequency of 5000 Hz.	10	4	6	1.5.1
	B	Design a linear phase FIR highpass filter using Hanning window function, for the specifications given below: Stopband edge = 2 kHz, Stopband attenuation ≥ 40 dB, Passband edge = 9.5 kHz, Passband attenuation < 1 dB, Sampling frequency = 25 kHz.	10	4	6	1.5.1
3	*A*	Determine 8-point DFT of the sequence $x(n) = \{1,2,4,8,16,32,64,128\}$ using radix-2 DIT FFT algorithm.	10	3	3	2.5.1
	B	Determine IDFT of the following sequence using radix-2 DIT-FFT algorithm: $X(k) = \begin{Bmatrix} 36, -4+j9.656, -4+j4, -4+j1.656, -4, \\ -4-j1.656, -4-j4, -4-j9.656 \end{Bmatrix}$	10	3	3	2.5.1
4	*A*	For the sequences $x_1(n) = \{1,1,2,2\}$ and $x_2(n) = \{1,2,3,4\}$, determine: *i.* linear convolution *ii.* circular periodic convolution using DFT / IDFT.	 02 08	3	3	1.5.1

	B	Discuss symmetry properties of DFT for a signal with following cases: *i.* real (even and odd) and *ii.* purely imaginary (even and odd).	10	2	3	1.5.1
5	*A*	Determine 8-point DFT of the sequence $x(n)=\begin{cases}1 & 0\le n\le 3\\ 0 & 4\le n\le 7\end{cases}$. Using DFT properties only determine, DFT of, $x_1(n)=\begin{cases}1 & n=0\\ 0 & 1\le n\le 4;\\ 1 & 5\le n\le 7\end{cases}$ $x_2(n)=\begin{cases}0 & 0\le n\le 1\\ 1 & 2\le n\le 5;\\ 0 & 6\le n\le 7\end{cases}$				
	B	Determine linear convolution of the following signals using convolution property of DTFT. $x_1(n)=nu(n)$ and $x_2(n)=(2)^n u(n-1)$.				
6	*A*	Derive the bilinear *z*-transformation mapping of *s*-plane poles and zeros into *z*-plane poles and zeros. Discuss the advantages and drawbacks of this mapping.	10	4	6 2	1.6.1
	B	A simple LRC notch filter has following normalized, s-plane transfer function: $$H(s)=\frac{s^2+1}{s^2+s+1}$$ Determine the transfer function of an equivalent digital filter using BLT. Assume a notch frequency of 60 Hz and sampling frequency of 960 Hz	10	4	6	1.6.1
7	*A*	Using frequency sampling method calculate the coefficients and draw realization diagram of a linear-phase FIR filter of length 15 which has a symmetric unit sample response and a frequency response that satisfies the condition, $$H\left(\frac{2\pi k}{15}\right)=\begin{cases}1, & k=0,1,2,3\\ 0.4, & k=4\\ 0, & k=5,6,7\end{cases}$$	10	4	3	1.5.1
	B	A causal system is represented by the following difference equation. $$y(n)+\frac{1}{4}y(n-1)=x(n)+\frac{1}{2}x(n-1)$$ Determine the system transfer function, impulse response and frequency response of the system. Show the magnitude and phase functions clearly.	10	2	3	1.5.1

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Munshi Nagar, Andheri (W) Mumbai – 400058

Re Examination - Jan. 2020 Examinations

Program: T.Y. B.Tech.(Electrical) **Duration: Three Hour**

Course Code: PC-BTE502 **Maximum Points: 100**

Course Name: Control System **Semester: V**

Notes:
1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.
2. Draw neat diagrams.
3. Assume suitable data if necessary

Q.No.	Questions	Points	CO	BL	PI
1. A	Define/describe in brief the following terms: 1. Transfer Function in time domain 2. Show Gain Margin and Phase Margin through Bode Plot. (Note : No need to write definition separately) 3. Write State and Output Equation with dimensions. 4. Bandwidth and Cut off rate. 5. BIBO and Asymptotic Notion of Stability 6. Acceleration Error Constant and Relative Stability ***Note: Please define precisely and briefly. Excessive unnecessary writing carries no marks.***	12			
1. B	Open loop transfer function of a unity feedback system is $G(s)=\frac{K}{s^3(s+20)}$ By sketching Bode plot, show that the system is unstable for all values of gain K.	08			
2. A	For the block diagram shown in **Fig.1**, determine C/R.	10			
2. B	Define the following terms in context of root locus a. Root Locus. b. Breakaway points c. Angle of Departure and Angle of Arrival d. Asymptotes and Centroid e. Angle and magnitude criterion (write only expressions). f. Write (only) Magnitude criterion.	06			

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Re Examination – Jan. 2020 Examinations

2. C	Determine if following systems are stable or unstable $G(s) = \frac{1}{s}$ *and* $G(s) = \frac{1}{s^2+1}$	04
3.A.	Derive an expression for peak overshoot for a typical second order system for unit step input.	10
3.B.	When the system shown in **Fig. 2.** Is subjected to the unit step input, the system output responds as shown in **Fig. 3.** Determine the values of K and T from the response curve.	10
4.A	Consider the armature controlled d.c. motor shown in **Fig.4** . In this system , R_a - Resistance of Armature (ohm) L_a - inductance of armature winding (H) i_a - armature current (A) i_f - field current (A) e_a - applied armature voltage (V) e_b - back emf(V) T_M - torque developed by motor (Nm) Θ - angular displacement of motor-shaft (rad) J - equibvlaent moment of inertia of motor and load referred to motor shaft (kg-m^2) fo - equivalent viscous friction coefficent of motor and load referred to motor shaft. Derive the transfer function **$G(s) = \theta(s)/E_a(s)$** and also draw the complete block diagram for the same.	10

4.B Consider a unity feedback system with $G(s) = \frac{K}{s(s+1)(s+10)}$ which is operating with **20%** overshoot. Determine for the closed loop system Dominant pole location using root locus technique. — **10**

5.A Measurements conducted on a servomechanism shows the system response to be $c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$ when subjected to a unit step input. Obtain the expression for the closed loop transfer function. — **10**

5.B a. Determine the stability of the following transfer function by using Rouths criterion. — **10**

$$T(s) = \frac{84}{s^8 + 5s^7 + 12s^6 + 25s^5 + 45s^4 + 50s^3 + 82s^2 + 60s + 84}$$

6. A unity feedback system with forward transfer function — **10+10**

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

is operating with a closed loop step response that has 15% overshoot. Do the following;

a. Evaluate the steady state error for a unit ramp input.
b. Design a lag compensator to improve the steady state error by a factor of 20.

7. A unity feedback system with forward transfer function — **20**

$G(s) = \frac{K}{(s+2)(s+3)(s+7)}$ is operating with 10% overshoot.

What is the value of the appropriate static error constant? Use bode plot technique to find the same.

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Re Examination – Jan. 2020 Examinations

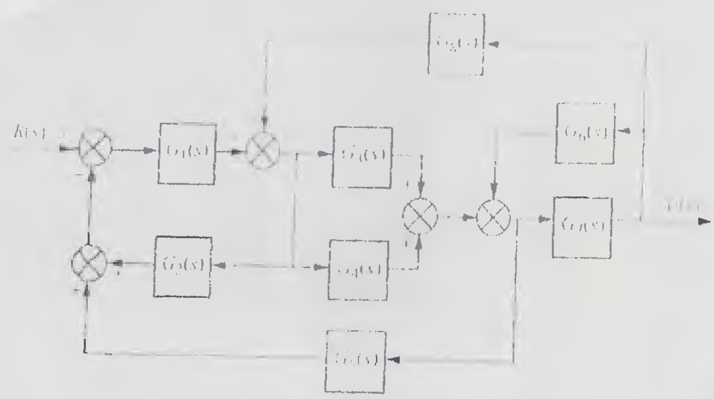

Fig. 1

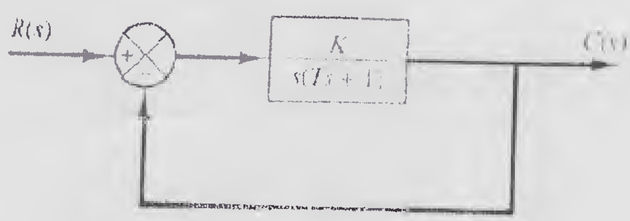

Fig. 2

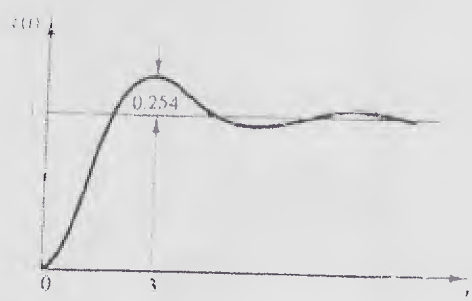

Fig. 3

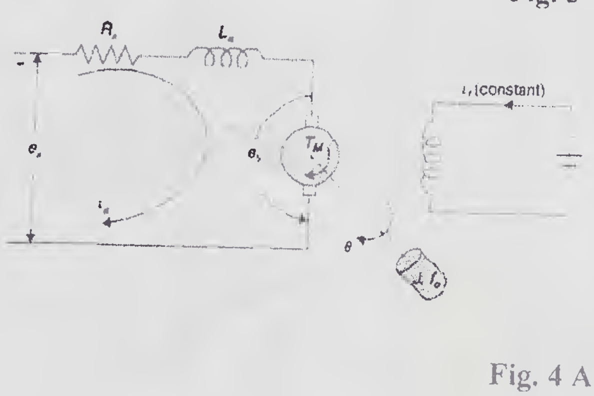

Fig. 4 Armature Controlled D.C. Motor

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Sardar Patel College of Engineering

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Munshi Nagar, Andheri (West), Mumbai – 400058

Re-examination

Program: Electrical Engineering — **Date: January 2020**
Duration: 3 hrs. — **Course code: PC-BTE503**
Maximum Marks: 100 — **Semester: V**

Course Name: Electrical Machines II

Note: Solve any five questions.
Assume suitable data if required.

Q. No.	Questions	Points	Co No	BL	PI
1 a.	Explain how the equivalent circuit parameters of a polyphase induction motor can be determined from no load and blocked rotor tests and per phase stator winding dc resistance	08	01	02	1.3.1
b.	Draw the circle diagram from no load and blocked rotor tests of three phase, 15KW, 440 V, six poles induction motor from the following results (line values) No load test: 440V, 15A, pf 0.2 Blocked rotor test: 100V, 30A, pf 0.4 Rotor copper loss at standstill is half the total copper loss. Calculate line current, slip, efficiency and power factor at full load	12	01	03	1.341
2 a.	Why is it not advisable to start wound rotor induction motor by the methods employed for starting squirrel cage induction motor? What are the advantages of inserting external resistance in the rotor circuit of wound rotor induction motor? With a neat diagram explain star delta starter.	10	01	03	1.3.1
b.	A 50 Hz, 440V, three phase, 4 pole induction motor develops half the rated torque at 1490rpm. With the applied voltage magnitude remaining at the rated value, what should be its frequency if the motor has to develop the same torque at 1600 rpm? Neglect stator and rotor winding resistances, leakage reactances and iron losses.	10	01	03	1.4.1
3 a.	Write short note on a> Stepper motor b>Brushless DC motor	10	03	02	1.3.1
b.	A 1100 V, 50 Hz, three phase star connected cylindrical rotor synchronous motor has its synchronous impedance of 0.7+j3.2 ohm per phase. It is working at rated voltage and rated frequency with an input of 350KW. The field current is adjusted to give an electromotive force of 1650V. Calculate the armature current, power factor and load angle.	10	02	03	1.4.1

<table>
<tr><td>4 a.</td><td>Explain double field revolving theory for single phase induction motor. Draw torque speed characteristic of the same. Discuss any one method of starting single phase induction motor.</td><td>08</td><td>03</td><td>02</td><td>1.3.1</td></tr>
<tr><td>b.</td><td>A 220V, 50Hz, 6 pole star connected alternator with ohmic resistance of 0.06 ohm per phase gave the following data for open circuit, short circuit and full load zero power factor charactristis:
<table>
<tr><td>I_f A</td><td>.2</td><td>.4</td><td>.6</td><td>.8</td><td>1</td><td>1.2</td><td>1.4</td><td>1.8</td><td>2.2</td><td>2.6</td><td>3</td><td>3.4</td></tr>
<tr><td>E_f V</td><td>29</td><td>58</td><td>87</td><td>116</td><td>146</td><td>172</td><td>194</td><td>232</td><td>261</td><td>284</td><td>300</td><td>310</td></tr>
<tr><td>Isc A</td><td>6.6</td><td>13</td><td>20</td><td>26</td><td>32</td><td>40</td><td>46</td><td>59</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td>V_z*</td><td>--</td><td>--</td><td>--</td><td>--</td><td>--</td><td>0</td><td>29</td><td>88</td><td>140</td><td>177</td><td>208</td><td>230</td></tr>
</table>
V_z* Zpf terminal voltage V

Find % voltage regulation at full load current of 40A at power factor of 0.8 lag by a> EMF method b> ZPF method.</td><td>12</td><td>02</td><td>03</td><td>1.4.1</td></tr>
<tr><td>5 a.</td><td>Explain how the excitation and power circles can be superimposed to obtain V curves of a cylindrical rotor synchronous motor</td><td>10</td><td>02</td><td>02</td><td>1.4.1</td></tr>
<tr><td>b.</td><td>Define synchronizing power. Give physical concepts of synchronizing power.</td><td>10</td><td>02</td><td>02</td><td>1.3.1</td></tr>
<tr><td>6 a.</td><td>Explain the two reaction theory as applied to salient pole synchronous machine and draw its phasor diagram for a lagging power factor.</td><td>08</td><td>02</td><td>02</td><td>1.3.1</td></tr>
<tr><td>b.</td><td>A three phase 400V star connected synchronous machine is synchronized with an infinite bus at rated voltage. The synchronous machine is now made to deliver a shaft load of 9.5kW. The machine resistance is negligible and X_d=5 ohm per phase and X_q = 3.2 ohm per phase.Friction, windage and core losses together 500W.For this shaft output calculate power angle, armature current, power factor,</td><td>12</td><td>02</td><td>02</td><td>1.3.1</td></tr>
<tr><td>7 a</td><td>Compare the performance of synchronous generator connected to an infinite bus and an isolated alternator operating on its own load.</td><td>05</td><td>02</td><td>02</td><td>1.3.1</td></tr>
<tr><td>b.</td><td>Discuss construction, principle of operation and application of permanent magnet synchronous motor</td><td>05</td><td>03</td><td>02</td><td>1.3.1</td></tr>
<tr><td>c.</td><td>Discuss causes of hunting? How is it overcome?</td><td>05</td><td>02</td><td>02</td><td>1.3.1</td></tr>
<tr><td>d</td><td>Explain distribution, pitch and winding factors.</td><td>05</td><td>01</td><td>02</td><td>1.3.1</td></tr>
</table>

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai - 400058

RE Exam – January 2020 Examinations

Program: Electrical

Course Code: PE-BTE502

Course Name: Computer Architecture

Duration: 3 hours

Maximum Points: 100

Semester: V

- Attempt **any 5** questions from the given 7 questions.
- Make suitable assumptions wherever necessary.

Q.No.	Questions	Points	CO	BL	PI
1a.	What is dynamic branch prediction? Explain how1 bit and 2 bit predictor methods are used for dynamic branch prediction.	10	1	2	1.4.1
1b.	Discuss the architecture and function of a general computer system.	10	2	2	1.4.1
2a.	I. Solve $(0111)_2 / (11)_2$ using the restoration division algorithm. II. Solve $(0.1011*2^{2}) - (0.1101*2^{-1})$ using floating point arithmetic.	06 04	2	3	2.1.3
2b.	Explain the working of magnetic hard disk. Explain what is a bad sector? Also discuss how capacity is calculated?	10	1	2	1.4.1
3.	Discuss the following architectures i. MIPS ii. VLIW	20	3	2	1.4.1
4a.	Differentiate between serial bus and parallel bus used for I/O interface w.r.t. advantages and disadvantages of each of them. (Take suitable example to explain the difference).	10	2	5	2.2.4
4b.	Explain the terms w.r.t. pipeline. i. Speed up ratio ii. Throughput iii. Clock frequency	10	2	2	1.4.1

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<table>
<tr><td>5a.</td><td>Compare the Real mode architecture with the protected mode architecture w.r.t. register model of 80386.</td><td>10</td><td>3</td><td>5</td><td>1.4.1</td></tr>
<tr><td>5b.</td><td>Consider a 4 stage pipeline processor. The number of cycles needed by the four instructions I1, I2, I3 and I4 in the stages S1, S2, S3 and S4 is shown below:
<table>
<tr><th></th><th>S1</th><th>S2</th><th>S3</th><th>S4</th></tr>
<tr><td>I1</td><td>3</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td>I2</td><td>1</td><td>4</td><td>2</td><td>2</td></tr>
<tr><td>I3</td><td>1</td><td>1</td><td>1</td><td>3</td></tr>
<tr><td>I4</td><td>1</td><td>3</td><td>2</td><td>2</td></tr>
</table>
What is the number of cycles needed to execute the following loop?
for(i=1 to 2)
{I1.I2.I3.I4}</td><td>10</td><td>1</td><td>4</td><td>1.3.1</td></tr>
<tr><td>6a.</td><td>The size of data count register of a DMA controller is 16 bits. The processor needs to transfer a file of 29,154 kilobytes from disk to the memory. The memory is byte addressable. The minimum no. of times the DMA controller needs to get control of the system bus from the Processor for transfer is _______.

(Assumption: Once DMA gets access to the system bus it completes transfer of all bytes which are indicate by the count register.)</td><td>05</td><td>1</td><td>3</td><td>2.3.1</td></tr>
<tr><td>6b.</td><td>Give the mechanism along with diagram for segment address translation from virtual address to its physical address.</td><td>10</td><td>1</td><td>2</td><td>1.4.1</td></tr>
</table>

6c.	For a Magnetic Disk: No. of tracks per surface = 250 Disk rotation speed = 3000 rpm Track storage capacity = 62,500 bits Average latency of device = P ms Data transfer rate = Q bits/sec Find P and Q.	05	2	3	2.4.1
7a.	On a non piplelined processor a program segment which is a part of ISR, is given to transfer 700 bytes from I/O device to memory Initialize the address register Initialize the count to 500 Loop: Load a byte from device Store in memory at address given by address reg. Decrement the address reg. Decrement the count If count $\neq 0$, goto Loop Load and store instructions take 2 clock cycles and other instructions 1 clock cycle. DMA can also implement the same transfer. DMA takes 20 clock cycles and 10 clock cycles to initiate and complete DMA transfers and 2ns to transfer 1 byte of data from device to memory. Calculate the approx. speed up ratio between DMA transfers and interrupt driven transfer of data. (Assume 1 clock cycle is of 1ns.)	05	1	6	2.2.4
7b.	Calculate the pointer address for LDT descriptor for the 32 bit processor from the following data: a. GDTR = 100000000000h b. LDTR Selector = F002h	05	1	3	2.4.1
7c.	Classify the system memory with respect to the closeness to the process with neat diagram and explain each component.	10	1,2	4	1.4.1

(2)

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REEXAMINATION JAN. 2020

(OLD COURSE)

Program: ELECTRICAL ENGG. **Duration: 3 HOURS**

Course Code: BTE306 **Maximum Points: 100**

Course Name: POWER ELECTRONICS **Semester: V**

Instructions:

- **Solve any five questions**
- **Assume suitable data if necessary and justify the same**

SN	Questions	Points	CO	BL	PI
Q1) a)	What are the different operating regions of Silicon Controlled Rectifier (SCR)? Explain with neat (V-I characteristic) diagram.	8	2	3	1.3.1
b)	Explain the application of inverter in power factor improvement, with circuit diagram.	8	2	3	1.3.1
c)	What is natural or line commutation in rectifiers?	4	4	3	1.3.1
Q2) a)	Write short note on any of the fully controlled power electronics switch using following points (a) Principle of operation, (b)characteristics, (c)rating (d) applications	12	2	2	1.3.1
b)	Discuss the working of a single phase AC voltage controller with R-L load when its firing angle is more than the load power factor angle. Illustrate with waveforms.	8	4	2	1.3.1
Q3) a)	Derive expression of average dc voltage for the three phase full wave controlled rectifier. Assume load current is continuous & constant.	10	2	2	
b)	Explain the effect of source side inductance on three phase and single phase rectifier output.	10	2	2	

Q4)	Draw circuit diagram (3M), output phase voltages (3M), output line voltages (3M), output line currents (3M) and input voltage (2M) of voltage source inverter with star connected R load when each semiconductor switch conducts for 180^0. Derive the phase and line voltages by considering load R=1 Ω (6M). (use graph paper for input and output voltage waveforms, line current waveforms should be drawn on answer sheet)	20	4	3	1.3.1
Q5)	Draw <u>input voltage, output voltage, input current and output current</u> waveforms for the following circuits.				
	a) Single phase full wave bridge controlled rectifier with $\alpha=120^0$ for "RLE" continuous current load and derive average output voltage	6	2	3	1.3.1
	b) Single phase full wave bridge controlled rectifier with RLE load, $\alpha>\theta$ and $\beta<\pi$	6	2		
	c) Single phase full bridge type inverter with "L" load	2	4		
	d) Single phase half wave controlled rectifier with 'R-L' load and freewheeling diode connected across load, derive average output voltage	6	2		
Q6) a)	With the help of input voltage, output voltage, voltage across inductor, voltage across capacitor, capacitor current, inductor current, load current waveforms and assumptions made, derive critical L and critical C of the DC-DC Buck regulator.	14	3	3	1.3.1
b)	Compare CSI and VSI.	6	4	2	1.3.1
Q7) a)	Why filters are required when power electronics devices are used? Which filters are used?	8	4	3	1.3.1
b)	Write short note on 'Sinusoidal triangular pulse width modulation scheme for inverter firing.	12	4	3	1.3.1