Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)

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

End Semester- Examination December-2022

B Tech Electrical Sem VII

Max. Marks: **100** Duration: **03 Hours**

Class: **Electrical** Sem.: **VII** Program: **B.Tech.**

Name of the Course: **Electric Drives** Course Code : **PC-BTE-701**

Instructions:

- Question no.1 is compulsory
- Solve any four from remaining questions
- Answers to all sub questions should be grouped together
- Figures to the right indicates full mark
- **Assume suitable data if required and justify the same.**

Ques. No	Description of Question	Max. Points	C.O.
Q.1 a.	What is the role of power modulator in Electrical Drive? Suggest the suitable power modulator for dc drive operating in regenerative braking mode.	05	02
b.	Draw the block diagram and explain in brief the closed loop control of drive having inner current control loop.	05	01
c.	Stator voltage control is preferred for fan type of load. Justify.	05	02
d.	What is permanent magnet synchronous motor (PMSM)? What are its advantages and disadvantages?	05	01
Q.2 a.	Draw the suitable control characteristics and discuss the mode of operation of electrical drive in acceleration mode.	10	01
b.	A 3-phase, 100 KW, 6 pole, 960 rpm wound rotor induction motor drives a load whose torque varies such that a torque of 3000 Nm of 10 sec duration is followed by a torque of 500 Nm of duration long enough to attain the steady state speed. Calculate the moment of inertia of the fly wheel, if motor torque should not exceed twice the rated value. Moment of inertia of the motor is 10 kg-m^2. Motor has linear speed-torque curve in the region of interest.	10	02
Q.3 a.	Three phase induction motor is fed with variable voltage and variable frequency (VVVF) supply. Discuss the operation of I.M for: (1) Supply voltage is constant and frequency is increased (2) Supply voltage is constant and frequency is decreased (3) Supply voltage is varied and frequency is varied. Draw the torque speed characteristics of three phase induction motor when motor is fed with:	10	02

	i) V_{rated}, F_{rated} ii) $V_{rated}/2, F_{rated}/2$ iii) $V_{rated}/2, F_{rated}$		
b.	A separately excited DC shunt motor is fed by four quadrant DC-DC converter. Draw the circuit diagram and explain the operation (motoring and braking) with voltage and current waveforms.	10	03
Q.4 a.	What is slip power recovery scheme? Discuss the static Scherbius drive. Derive the torque expression and draw the torque speed characteristics.	12	03
b.	A 3-ph, 440V, 50Hz, 6-pole, Y-connected induction motor has following parameters, R_S=0.5 Ω, R_r'=0.6 Ω, X_s=X_r'=1.0 Ω. Stator to rotor turns ratio is 2. If the motor is used for regenerative braking determine: (i) Maximum overhauling torque it can hold and the range of the speed in which it can safely operate. (ii) The speed at which it will hold a load with a load torque of 160 Nm.	08	03
Q.5 a.	Discuss the dynamic braking applied to three phase induction motor. Derive the expression for the torque and slip of motor for dynamic braking operation.	08	01
b.	A three phase star connected induction motor is stopped by dynamic braking. The dc current is 15 A. Calculate the equivalent ac current when dynamic braking is achieved by two lead connections and three lead connections.	04	02
c.	A Y-connected squirrel cage induction motor has the following ratings and parameters: 400V, 50Hz, 4-pole, 1370rpm, R_S=2Ω, R_r'=3Ω, X_s=X_r'=3.5 Ω. Calculate motor breakdown torque for inverter fed induction motor for a frequency of 60 Hz as a ratio of its 50 Hz.	08	03
Q.6 a.	Draw and explain the block diagram of closed loop control of induction motor using V/F control.	08	03
b.	Discuss the dynamic braking of separately excited dc motor when: (i) Braking resistance is maintained constant (ii) Braking torque is maintained constant	06	02
c.	A 230V, 1000 rpm motor, 105A separately excited dc motor has an armature resistance of 0.06 Ω. Calculate the flux as percent of rated flux for motor speed of 1500 rpm when load is such that the developed motor power is maintained constant at rated value for all speeds above the rated speed.	06	02
Q.7a.	Discuss the method of calculation of moment of inertia by retardation test. Comment on the rotational and core losses in the machine.	10	01
b.	Derive the expression for the condition of steady state stability of electrical drive.	10	01

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END SEM EXAMINATION DEC 2022

Program: BTech (Elect) Sem VII — 7/12/22 — **Duration:** 1 hr

Course Code: PE-BTE701 — **Maximum Points:** 100

Course Name: Wind & Solar Energy Systems — **Semester:** VII

Notes: Q.1 is compulsory. Attempt ANY 4 questions from remaining. Draw neat labeled diagrams wherever required.

Q.No.	Questions	Points	CO	BL
1	Answer following questions in BRIEF- a. Draw a detailed schematic of a grid connected variable speed wind power system. b. Define the term solstice & equinox c. How power quality issues are introduced in the system while integrating RE source to the grid? d. Draw basic block diagram of MPPT	10	4	1
2.a	Explain following categories of wind turbines- a. Constant speed, Constant frequency b. Variable speed, Variable frequency	10	2	2
2.b	Using a neat schematic explain 2 control strategies employed in wind turbines.	10	1	3
3.a	Draw neat labelled diagram of an Aifoil & Explain how drag and lift force are generated on it.	10	1	2
3.b	Calculate how many degree earth should rotate to catch sun's meridian at solar noon(consider at 12 pm) at following time- a. 9.30 am b. 2.15 pm c. 6.00 pm d. 12.00 am e. 5.45 am	10	3	5
4.a	From the given information, design **on-grid** solar PV system. Draw PV array line diagram and on-grid system line diagram as well. Data given- Avg. required day usage = 12 units , Avg. required day usage = 6 units	10	4	6

END SEM EXAMINATION DEC 2022

	PSH of the site= 4.2 hrs Rated Panel power = 250 Wp, 12 V Max. temp of site= 37.5 deg. Temp. effect on panel = 0.5 %/deg. Celsius above 25 deg. Inverter efficiency = 95% Manufacturing tolerance= 5 % Dirt effect = 3 %			
4.b	Explain Hill climbing/P & O method of MPPT	10	4	2
5.a	State the Grid integration rules for following parameters as per CEA - a. Overvoltage b. Undervoltage c. Harmonics	10	5	1
5.b	With neat diagram, explain the following concentrating collectors- a. Cylindrical parabolic CC b. Paraboloid CC	10	6	2
6.a	Draw neat labelled diagrams of following- a. Low temperature power generation cycle using LFPC b. Solar chimney power plant c. High temperature power generation power plant	10	6	4
6.b	Discuss the technical issues that need to be addressed while integrating RE resources on the distribution system. 1. Point of common coupling (PCC) and Voltage level 2. Voltage ride-through capability 3. Frequency regulation capability	10	5	2

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END SEMESTER DECEMBER2022

Programme:B. Tech in Electrical Engineering Sem VII

Course Code: PE-BTE704

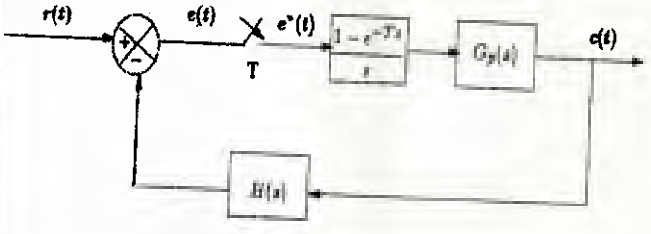
Course Name: Digital Control Design

Duration:3 Hr

Maximum Points:100

Semester: VII

Note: Q1 is compulsory. Solve any four questions from the remaining six.
Assume suitable data if required and justify the assumptions.

Q.No.	Questions	Points	CO	BL	Module No.
1	a. How transient response analysis is done in z domain? b. Discuss how Nyquist stability criteria is applied in z domain c. Discuss separation principle for controller with observer. d. Compare different s plane to z plane mapping techniques. e. Discuss effect of sampling and quantization on discrete representation of continuous system	20	1-4	03	1-6
2 a	Calculate the steady state errors for unit step, unit ramp and unit parabolic inputs for the unity feedback system shown below with $G_p(s) = \frac{5}{s(s+1)}$ and $T = 1\ sec$ 	05	01	03	01
b	Find the equivalent sampled impulse response and pulse transfer function in the cases (1) and (2) if two analog systems $H_1(s) = \frac{1}{s+4}$ and $H_2(s) = \frac{2}{s+4}$	05	01	03	02

	are in cascade with sampled input Case (1) If the systems are directly connected Case (2) If the systems are separated by sampler				
c	What is dead beat controller? Discuss dead beat controller design when system poles and zeros are inside the unit circle. Design the dead beat controller if plant transfer function is given by $$Gp(z) = \frac{(z+0.2)}{(z-0.1)(2-0.4)}$$ Consider step input. Show how does the output follows input sequence.	10	01	02,06	02
3a	How Lyapunov stability criterion is applied to verify stability of discrete time LTI system? Use Lyapunov approach to determine stability of the following discrete time LTI system $$x[k+1] = \begin{bmatrix} 0.3 & -0.1 \\ 0.1 & 0.22 \end{bmatrix} x[k]$$	07	02	04	04
b	What is Jury's stability test? Use Jury's test to determine stability of the system with characteristic equation $$z^5 - 0.25z^4 + 0.1z^3 + 0.4z^2 + 0.3z - 0.1 = 0$$	07	02	03	03
c	Determine the range of K for which the closed loop unity feedback system with loop gain G(s) will be stable, where, $$G(s) = \frac{k(z+0.1)}{(z-0.7)(z-0.9)}$$	06	02	03	03
4a	The discrete time system is represented by $x(k+1) = Fx(k) + gu(k)$ *and* $Y(k) = Cx(k)$ Where F=$\begin{bmatrix} 0 & 1 \\ -0.2 & -1 \end{bmatrix}$ g=$\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ C=[1 0] Obtain $x(k)$*and* $y(k)$ if input is unit step. The initial state is given by $x(0) = \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$	10	03	03	04
b	Consider the following discrete transfer function. $$G(z) = \frac{0.1z + 0.3}{z^2 - 1.2z + 0.32}$$ Write state space model in the following forms (i) Controllable Canonical form	05	03	04	04

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	(ii) Observable canonical form (iii) Jordan Canonical form				
c	Obtain transfer function for the following system $\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 1 & -4 \\ 0.5 & -1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u(k)$ $y(k) = 2x_1(k)$	05	03	05	04
5 a	Compare regulation problem with set point tracking problem. Evaluate the expression for set point tracking. For the following system the state feedback control input for stabilization and tracking is given by $u = -kx + Nr$. The desired closed loop poles are at 0.2 and 0.4. Determine k and N such that output follows step input $x[k+1] = \begin{bmatrix} 0 & 1 \\ -0.5 & 1.5 \end{bmatrix} x[k] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u[k]$ *and* $y[k] = [0.005 \quad 0.008]x[k]$	10	04	03,05	05,07
b	For the system $x(k+1) = Fx(k) + gu(k)$, $F = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}$ and $g = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ Determine if the system is controllable or not by a. Kalman Test b. Gilbertz test. If the system is controllable, design state feedback gain matrix so that the closed loop poles are at z=0.5+j0.5 and z=0.5-j0.5	10	04	03.05	05,06
6 a	Check the observability of the following system. If the system is observable, design full order observer such that observer poles are at 0.2 and 0.4 $x[k+1] = \begin{bmatrix} 0 & 1 \\ 10 & 0 \end{bmatrix} x[k] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u[k]$ and $y[k] = [1 \quad 0]x[k]$	10	04	03,06	05,06

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b	Compare full order observer with reduced order observer. Design reduced order observer for the system where state x1 is measurable and states x2 and x3 are to be estimated. The system matrix $F = \begin{bmatrix} 0 & 0 & -3 \\ 1 & 0 & 1 \\ 0 & 1 & -2 \end{bmatrix}$. Assume suitable data with justification	10	04	04,06	06
7 a	Compare state feedback controller with output feedback controller. Why all eigen values cannot be placed while designing output feedback control? Discuss the factors on which the number of eigen values that can be placed arbitrarily depend.	05	04	04	07
b	Design output feedback controller for the system with two desired poles at z=0.2 and z=0.3 and state equations as x(k+1)=F x(k)+g$U(k)$ *and* $y(k) - Cx(k)$ where, $F = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & 0 & 0 \end{bmatrix}$, $g = \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$	15	04	06	07

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End Semester - December 2022 Examinations

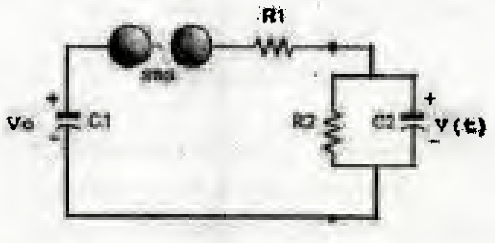
Program: B. Tech. (Electrical) Sem VII 9/12/22 **Duration: 3 hrs.**

Course Code: PE-BTE706 **Maximum Points: 100**

Course Name: High Voltage Engineering **Semester: VII**

Notes:

1. Question number 1 compulsory.
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams.
4. Assume suitable data if necessary.

Q.No.	Questions	Points	CO	BL	Mod. No.
1.(a)	A 100 kVA, 400 V/250 kV testing transformer has 6% leakage reactance and 4% resistance on 100 kVA base. A cable has to be tested at 500 kV using the above transformer as a resonant transformer at 50 Hz. If the charging current of the cable at 500 kV is 0.2 A, find the series inductance required. Assume 2 % resistance for the inductor to be used and the connecting leads. Neglect dielectric loss of the cable. What will be the input voltage to the transformer?	10	2	L3	3
1.(b)	Draw neat diagram of equivalent circuit of single stage impulse generator. A twelve stage impulse generator has 0.126 μF capacitors. The wave front and wave tail resistances are 800 ohms and 5000 ohms respectively. If the load capacitance is 1000 pF, determine the wave front and wave tail times of the impulse wave.	10	2	L3	3
2. (a)	Derive expression for wave front time and wave tail time of following Fig.1  Fig.1	14	2	L2	3

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2.(b)	The suspended solid particle of paper and air pocket present in transformer oil with diameter 0.6 mm and 1.2 mm respectively. Find the force on each suspended particle if applied electric field is $E^2 = 12x + 4$ V/m Given: Relative permittivity of paper = 2.3 Relative Permittivity of transformer oil = 2.2	**06**	3	L3	2
3. (a)	Derive expression for Townsend's first and secondary ionization coefficients. How is the condition for breakdown obtained in a Townsend's discharge?	**10**	1	L2	1
3.(b)	With the help of neat diagram explain in detail 1. construction and working principle of valve type light arrester 2. significance of **By-pass gap** in valve type lightning arrester	**10**	2	L1	5
4.(a)	Explain 'Generating Voltmeter' for H.V. measurement and prove that $i_{rms} = \frac{VC_m\omega}{\sqrt{2}}$	10	2	L2	4
4.(b)	Draw layout and explain operation of UHV Laboratory in detail.	10	4	L4	6
5.	Explain the term 1. Partial discharge or internal discharge 2. Solid dielectric used in practice 3. Series-parallel resonance circuit for generation of high voltage AC 4. Characteristics of impulse voltage waveform 5. Series impedance voltmeter	20	1	L1	2,4,5
6.(a)	A generating voltmeter has to be designed so that it can have a range from 10 to 100 KV d.c. If the indicating meter reads a minimum current of 1.5 μA and maximum current of 18 μA, what should the capacitance of the generating voltmeter?	05	2	L3	5

(b)	Discuss the effect of following parameters on the breakdown strength of liquids : a) Suspended particle mechanism b) Cavitation and bubble theory c) Stressed oil volume theory	10	1	L2	2
(c)	Explain the terms as referred to high voltage testing. **(Explain is short)** 1. Withstand voltage 2. Flashover voltage 3. 50% flash over voltage 4. Wet and dry power frequency tests 5. Chopped wave	05	1	L1	3
7.(a)	Explain in detail Paschen's theory for breakdown in gas insulating material.	05	1	L1	1
(b)	A solid specimen of dielectric has a dielectric constant of 4.2 and $tan\delta$ as 0.001 at a frequency of 50 Hz. If it is subjected to an alternating field of 50kV/cm, calculate the heat generated in the specimen due to the dielectric loss.	03	3	L3	2
(c)	Explain in detail construction and working principle of Vaan de Graff generator.	08	1	L2	3
(d)	Determine the electromechanical breakdown voltage stress of PMMC sheet 4 mm thick, relative permittivity 4 and Young's modulus 1000 kg/m^2 when subjected to an impulse voltage.	04	3	L3	3

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End Semester- Examination December-2022

9/12/22

Max. Points: **100**
Class: **Electrical** B.Tech (Elect) Sem VII
Course Code : **PE-BTE-707**
Name of the Course: **Power Electronics Application in Power System**

Duration: **03 Hours**
Program: **B.Tech.**
Sem.: **VII**

Instructions:

- Question no.1 is compulsory
- Solve any four from remaining questions
- Answers to all sub questions should be grouped together
- Figures to the right indicates full mark
- **Assume suitable data if required** and justify the same.

Ques. No	Description of Question	Max. Pts.	C.O.
Q.1 a.	What are the effects of harmonics on the operation of power system equipment?	05	02
b.	What are the characteristics of ideal compensator?	05	01
c.	Draw the block diagram and discuss the operation of harmonic oscillator.	05	03
d.	What are the advantages of using the reference frame rotating at synchronous speed in electrical system?	05	01
Q.2 a.	Discuss the control of Synchronous Link Converter Var Compensator (SLCVC) where DC link voltage is controlled to vary the reactive power. In this method, consider the cases when reference reactive power is increased and decreased.	12	03
b.	What is the peak value of output phase voltage and line voltage of inverter in case of space vector modulation? Compare these values with square inverter technique.	08	03
Q.3 a.	The SLCVC is ideal and controlled using SINE-Δ PWM method with modulation index, m=1. The source voltage is given by: Vs=300 sin(100πt) and value of inductance is 25 μH. Calculate the magnitude of DC voltage to supply the (a) 100 KVAR leading reactive power (b) 100 KVAR lagging reactive power.	08	03
b.	Derive instantaneous active and reactive power in terms of two phase stationary components.	08	03

c.	Draw the circuit and explain the features of hybrid filter.	04	01
Q.4 a.	What is instantaneous reactive current? Draw the block diagram and explain in detail the instantaneous reactive power compensation.	12	01
b.	Derive the expression for active power and reactive power flow over transmission line when midpoint compensation is provided. Draw the power angle curve.	08	03
Q.5 a.	Draw the block diagram and explain the implementation of PLL to generate three sinusoidal signals which are in phase with fundamental frequency components of source voltages.	12	01
b.	What is GCSC. Explain the operation of GCSC. Discuss the different mode of operation	08	03
Q.6 a.	What is static synchronous series compensator (SSSC)? Show that by controlling injecting voltage of SSSC power flow over transmission line is reversed. Discuss the voltage compensation mode of SSSC.	08	03
b.	What is UPFC? Derive the expression for transmitted active power and reactive power supplied by receiving end when UPFC is used to control the transmission line parameters	12	03
Q.7a.	What are the advantages of HVDC over HVAC? What are the different circuits used in HVDC for power transfer.	10.	01
b.	Prove that the HVDC converter (rectifier/inverter) consumes reactive power. What are the ways by which the reactive power is provided to these converters (only names).	06	01
c.	What are the issues of two level operation of inverter for large power control? How these issues are addressed in multilevel inverter.	04	01

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END SEM EXAMINATION DECEMBER 2022 9/12/22.

Program: B. Tech Electrical Engineering Sem VII **Duration: 3 hrs.**

Course Code: PE-BTE708 **Maximum Points: 100**

Course Name: Computer Aided Power System Analysis **Semester: VII**

Notes: Attempt any five questions.

Q. No	Questions	Points	CO	BL	Module No.
Q. 1	Figure 1 shows the one-line diagram of a simple four-bus system. Table 1 gives the line impedances identified by the buses on which these terminate. The generators are connected at all the four buses, while loads are at buses 2 and 3. Values of real and reactive power are listed in table 2. Assuming a flat voltage start, find Q_2, bus angle δ_2 for bus 2, bus voltages V_3 and V_4 for bus 3 and 4 at the end of the first GS iteration.	20	01	BL 1, 2	01

Figure 1

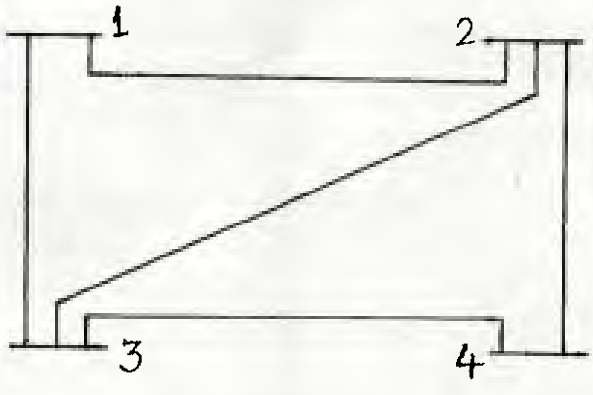

Table 1

Line, bus to bus	R (pu)	X (pu)
1-2	0.05	0.15
1-3	0.10	0.30
2-3	0.15	0.45
2-4	0.10	0.30
3-4	0.05	0.15

Table 2

Bus	P (pu)	Q (pu)	V (pu)	Remarks
1	--	--	1.04<0°	Slack bus
2	0.5	--	|V2|= 1.04pu	PV bus
3	-1.0	0.5	--	PQ bus
4	0.3	-0.1	--	PQ bus

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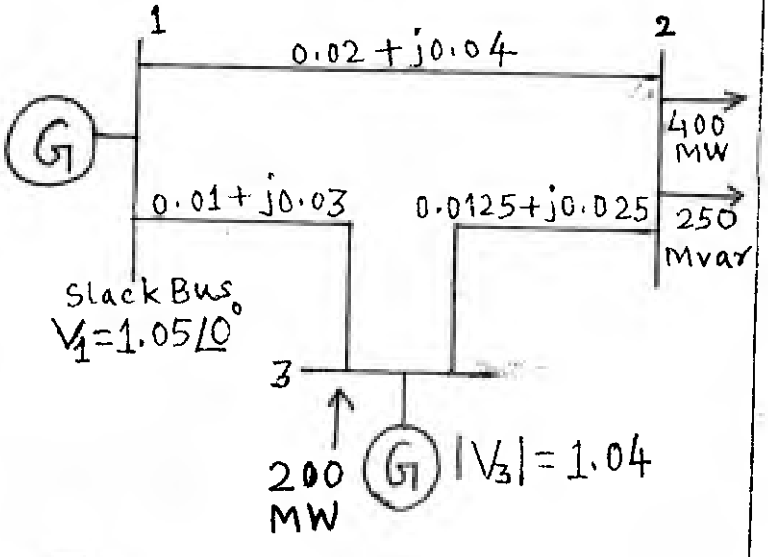
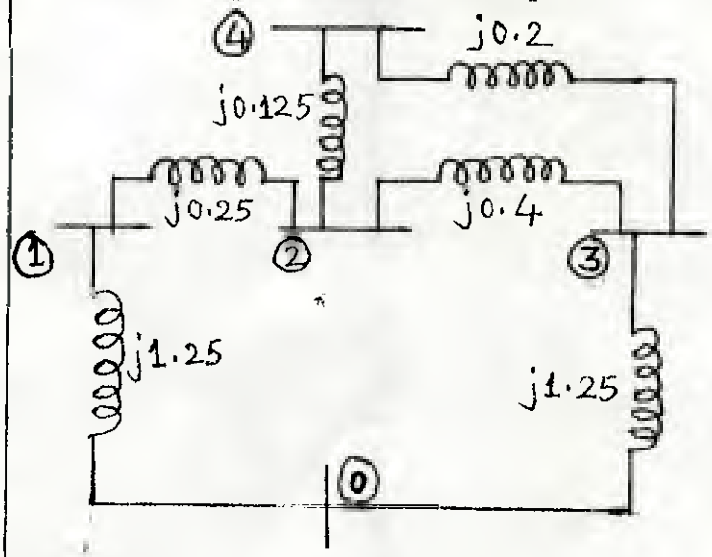
Q. 2 (a)	Explain power flow solution algorithm by Newton Raphson load flow method with the help of flow chart.	05+05	01	BL 1	01
Q. 2 (b)	Discuss AC DC system power flow analysis by sequential and simultaneous solution algorithm.	10	01	BL 2	03
Q. 3	Figure below shows the one-line diagram of a simple three bus power system with generators at buses 1 and 3. The magnitude of voltage at bus 1 is adjusted to 1.05 pu. Voltage magnitude at bus 3 is fixed at 1.04 pu with a real power generation of 200 MW. A load consisting of 400 MW and 250 Mvar is taken from bus 2. Line impedances are marked in per unit on a 100 MVA base, and the line charging susceptances are neglected. Obtain the power flow solution by the Newton-Raphson method including line flows and line losses. 	20	01	BL 1, 2	03
Q. 4 (a)	Use the Lagrangian multiplier method for solving constraint parameter optimization problems to determine as isosceles triangle of maximum area that may be inscribed in a circle of radius 1.	10	03	BL 1, 2	02
Q. 4 (b)	Find minimum value of the function $f(x, y) = x^2 + 2y^2$ subject to equality constraint $g(x, y) = x + 2y + 4 = 0$ Check for sufficient condition.	10	03	BL 1, 2	04

END SEM EXAMINATION DECEMBER 2022

Q. 5 (a)	Discuss different types of fault that occurred in power system.	05	02	BL 1	05
Q. 5 (b)	Determine Z_{bus} for the network shown in below figure where all the impedances shown are in per unit. 	15	02	BL 1, 2	05
Q. 6 (a)	Explain the role of state estimation in power system operation. Hence, discuss what is Linear State estimation?	10	04	BL 1	06
Q. 6 (b)	Discuss different network topology processing used for power system state estimation.	10	04	BL 1	06
Q. 7 (a)	Discuss static security analysis at control center of power system with different static security levels.	10	05	BL 1	07
Q. 7 (b)	Discuss different approaches for contingency selection used for security analysis of power system.	10	05	BL 1	07

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Sardar Patel College of Engineering

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

End Semester Examination [December 2022]

Academic Year 2022 – 23 [First Half]

Program: B. Tech. Electrical Engineering Sem VII — **Semester:** VII

Course: Engineering Economics [Open Elective] — **Date:** 12th Dec 2022

Course Code: OE –BTE702 — **Total Points:** 100

Note: Solve any **FIVE** questions of the following. Each question carries equal points.

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

Q. No.	Question	Points	BL	PI
1.	a. Discuss the factors which influence demand and supply.	06	L2	1.3.1
	b. Explain the concept of *Breakeven Analysis* with proper diagram.	06	L2	1.3.1
	c. Define *Value*? What are the types of value?	08	L3	2.1.3
2.	a. Three years back, a municipality purchased a 10 hp motor for pumping drinking water. Its useful life was estimated to be 10 years. Due to the fast development of that locality, the municipality is unable to meet the current demand for water with the existing motor. The municipality can cope with the situation either by augmenting an additional 5 hp motor or replacing the existing 10 hp motor with a new 15 hp motor. The details of these motors are tabulated below:	10	L3	2.1.3

	Old 10 hp motor	*New 5 hp motor*	*New 15 hp motor*
Purchase cost (*P*) Rs.	25,000	10,000	35,000
Life in years (*n*)	10	7	7
Salvage value at the end of machine life (Rs.)	1,500	800	4,000
Annual operating & maintenance cost (Rs.)	1,600	1,000	500

The current market value of the 10 HP motor is Rs. 10,000. Using an interest rate of 15%, find the best alternative.

	b. The Chief Engineer of refinery operations is not satisfied with the preliminary design for storage tanks. The Design Engineer was asked to reconsider the overall dimensions of the storage tanks. The original design called for 4 tanks 5.2 m in diameter and 7 m in height. The Design Engineer found that the present ratio of height to diameter of 1.35 is 111% of the minimum cost and that the minimum cost for a tank was when the ratio of height to diameter was 4:1. The cost for the tank design as originally submitted was estimated to be Rs. 9,00,000/-. What are the optimum tank dimensions if the volume remains the same as for the original design? What total savings may be expected through the redesign?	10	L3	2.3.1
3.	a. Briefly explain the various criteria for make or buy decisions.	10	L2	1.4.1
	b. Enlist and explain the different approaches of *make or buy decisions* with example.	10	L3	1.3.4

4.	a A company has purchased an equipment whose first cost is Rs. 1,00,000 with an estimated life of eight years. The estimated salvage value of the equipment at the end of its lifetime is Rs. 20,000. Give the calculations of *net depreciation* and *book value* till the end of life of the equipment, using the *sinking fund method of depreciation* with an interest rate of 12%, compounded annually.	10	L5	3.1.5
	b. John is planning for his retired life. He has 10 more years of service. He would like to deposit Rs. 8,500 at the end of the 1st year and thereafter he wishes to deposit the amount with an annual decrease of Rs 500 for the next 9 years with an interest rate of 15%. Find the total amount at the end of 10th year of the above series.	10	L5	2.1.3
5.	a. A company has already identified machine A and determined the economic life as four years by assuming 15% interest rate. The annual equivalent total cost corresponding to the economic life is Rs. 2,780. Now, the manufacturer of machine B has approached the company. Machine B, which has the same capacity as that of machine A, is priced at Rs. 6,000. The maintenance cost of machine B is estimated at Rs. 1,500 for the first year and an equal yearly increment of Rs. 300 thereafter. If the money is worth 15% per year, which machine should be purchased? (Assume that the scrap value of each of the machines is negligible at any year.)	10	L3	2.2.2
	b. An inland state is presently connected to a seaport by means of a railroad system. The annual goods transported is 1,00,00,000 ton km. The average transport charge is Rs. 30/ton/km. Within the next 20 years, the transport is likely to increase by 10,00,000 ton km per year. It is proposed to broaden a river flowing from the state to the seaport at a cost of Rs. 2,50,00,00,000. This will make the river navigable to barges and will reduce the transport cost to Rs. 10.00/ton/km. The project will be financed by 10% bond at par. There would be some side effects of the change-over as follows: *i.* The railroad would be bankrupt and be sold for no salvage value. The right of way, worth about Rs. 3,00,00,000, will revert to the state. *ii.* 300 employees will be out of employment. The state will have to pay to each of them a welfare cheque of Rs. 48,000/year. *iii.* The reduction in the income from the taxes on the railroad will be compensated by the taxes on the barges. What is the benefit-cost ratio based on the next 20 years of operation? Also, check whether broadening the river is justified.	10	L3	1.4.1
6.	a. The demand for an item is 12,000/year. Its production rate is 2,000/month. The carrying cost is Re. 0.20/unit/month and the set-up cost is Rs. 400.00/set-up. The shortage cost is Rs. 15.00/unit/year. Find all the parameters of *inventory system.*	10	L3	2.2.3
	b. A company is planning to expand its present business activity. It has two alternatives for the expansion programme and the corresponding cash flows are tabulated below. Each alternative has a life of five years and a negligible salvage value. The minimum attractive rate of return for the company is 12%. Suggest the best alternative to the company.	10	L2	1.3.2

	Initial investment (Rs.)	*Yearly revenue* (Rs.)
Alternative 1	5,00,000	1,70,000
Alternative 2	8,00,000	2,70,000

7.	a. What are the types of models of inventory system? Explain them in brief.	10	L5	2.2.4
	b. A government is planning a hydroelectric project for a river basin. Besides the production of electric power, this project will provide flood control, irrigation and recreation benefits. The estimated benefits and costs expected from the three alternatives under consideration are listed in the following table:	10	L5	2.2.4

	A (Rs.)	*B* (Rs.)	*C* (Rs.)
Initial cost (*P*)	15,00,00,000	25,00,00,000	40,00,00,000
Annual equivalent benefits & cost			
(a) Operating & maintenance cost	20,00,000	25,00,000	35,00,000
(b) Power sales/year	1,00,00,000	1,20,00,000	1,80,00,000
(c) Flood control savings	25,00,000	35,00,000	50,00,000
(d) Irrigation benefits	35,00,000	45,00,000	60,00,000
(e) Recreation benefits	10,00,000	20,00,000	35,00,000

If the interest rate is 10% and the life of the projects is estimated to be 40 years, by comparing the BC ratios, determine which project should be selected.

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058

END SEM EXAMINATION DECEMBER 2022

Program: Electrical Engineering **Duration: 3 Hr**

Course Code: OE-BTE703 **Maximum Points: 100**

Course Name: Embedded System **Semester: VII**

Notes:

- **Question one is compulsory.**
- **Solve any four of remaining six questions.**
- Illustrate your answers with neat sketches wherever necessary.
- Assume appropriate data if required and state your reason.
- Preferably, write the answers in sequential order.

Q.No.	Questions	Points	CO	BL	Module No.
1.A	Consider the following embedded systems: a pager, a computer printer, and an automobile cruise controller. Create a table with each example as a column, and each row one of the following design metrics: unit cost, performance, size, and power. For each table entry, explain whether the constraint on the design metric is very tight. Indicate in the performance entry whether the system is highly reactive or not.	5	1	2	1
B	Create a C program that efficiently tests each bit of an input port and prints a message to tell the state of the bit.	5	2	1	2
C	The ARM processor is to be use for object detection, consider an application, and what features of ARM processor are used to develop the said system. Draw the blocks of the same system.	5	3	2	3
D	Explain serial communication techniques with neat diagram.	5	3	2	4
2.A	What is embedded system? Explain the hardware architecture of embedded system.	5	1	2	1
B	What are the different types of microcontroller? Give classification of microcontroller.	5	1	1	1
C	Define: pointers and null pointers, local variables, static variables, global variables, Structure & union. Differentiate between C and C++.	5	2	1	2
D	Explain function and recursive function with example.	5	2	1	2
3.A	Classify the embedded systems into small scale, medium scale and sophisticated systems. Now, reclassify these embedded systems with and without real time systems and give one example of each.	5	1	1	1

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B	Explain include directives for inclusion of files, source file, configuration file with example.	5	2	1	2
C	Explain structures and unions with example.	5	2	1	2
D	Discuss I/O operations with examples.	5	2	1	2
4.A	Explain with necessary coding and examples, how flow of control is changed using branch instructions in ARM.	5	3	2	3
B	List the registers of ARM processor for all operating modes.	5	3	2	3
C	Discuss program counter, link register and instruction pipeline with example.	5	3	2	3
D	Discuss the memories used in developing embedded system with one example of each.	5	1	2	1
5.A	How code density achieved in ARM processor using Thumb instruction? Explain with example.	5	3	2	3
B	Discuss byte ordering techniques with example.	5	3	2	3
C	What is the difference between Von Neumann architecture and Harvard architecture?	5	1	2	1
D	Explain in detail SPI communication protocol and its interfacing techniques.	5	3	3	4
6.A	Describe the 7-segment LED interfacing with microcontroller.	5	3	3	4
B	Write short note on transport layer protocol.	5	3	2	4
C	Explain analog interfacing with microcontroller.	5	3	3	4
D	What is RTOS? Define Process, Task, Threads, and Semaphore.	5	4	1	5
7.A	Explain any one applications of embedded system for field of Medical with neat block diagram and flow control.	6	4	3	7
B	Draw and discuss the complete block diagram, Hardware and Software architecture of Smart card access control system.	6	4	3	7
C	Consider a payroll processing system for a small manufacturing firm. Describe three different scenarios in which the system can be justified as hard, firm, or soft real-time	8	4	3	7

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END SEM EXAMINATION DECEMBER 2022

Program: Electrical Engineering **Duration: 3 Hr**

Course Code: OE-BTE704 **Maximum Points: 100**

Course Name: Internet of Things **Semester: VII**

Notes:

- **Question one is compulsory.**
- **Solve any four of remaining six questions.**
- Illustrate your answers with neat sketches wherever necessary.
- Assume appropriate data if required and state your reason.
- Preferably, write the answers in sequential order.

Q.No.	Questions	Points	CO	BL	Module No.
1.A	Write the program to calculate average grade of student in python and describe the procedure to run the program from IDLE and CMD.	5	4	2	1
B	What are the factors and characteristics to be consider while choosing a sensor for IoT applications?	5	3	3	4
C	What are the advantages and disadvantages of contention-free and contention-based medium access strategies? Can you think of scenarios where one would be preferable over the other?	5	2	2	3
D	What effect will the internet of things (IoT) have in healthcare? Explain with any one example of smart device.	5	4	3	6
2.A	What are components of physical design of IoT? Explain link layer protocol with example.	5	1	2	1
B	Define IoT; Explain Things / Objects in IOT with example. List the applications of IoT.	5	1	2	1
C	What are components of logical design of IoT? Explain request-response communication model.	5	1	2	1
D	Discuss Websocket-based communication API.				1
3.A	What is Machine to Machine communication (M2M)? What are the different key features of M2M?	5	1	2	2
B	What is SDN? Discuss architecture of SDN.	5	1	2	2
C	What are the key features of M2M communication?	5	1	2	2
D	Explain key elements of SDN.	5	1	2	2
4.A	Explain different issues wireless medium access.	5	2	2	3

END SEM EXAMINATION DECEMBER 2022

B	Discuss the characteristics of MAC protocol in sensor network.	5	2	1	3
C	Explain hidden terminal and exposed terminal problems in wireless sensor network.	5	2	2	3
D	Describe Power Aware Multi-Access with Signaling, and Sensor MAC.	5	2	2	3
5.A	What is IoT Gateway? Discuss the roles of IoT Gateway.	5	3	2	4
B	Describe the different elements of IoT.	5	3	2	4
C	Describe three layer architecture of IoT.	5	3	2	4
D	What are the common conversion methods and commonly measured quantities using sensor nodes?	5	3	2	4
6.A	Give examples of IoTs used in a smart home with sensors, actuators and smart home automation software.	10	4	3	6
B	Determine the various communication models that can be used for weather monitoring system. Which is a more appropriate model for this system? Describe the pros and cons.	10	4	3	6
7.A	Write short note on: Numbers, Strings, Lists, Tuples, and Dictionaries.	5	4	1	7
B	Describe 5 main principles that must be taken into account by IoT developers before creating an application.	5	4	3	7
C	What is python? Differentiate between program and script.	5	4	2	7
D	Write short note on classes in python.	5	4	2	7