Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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

END SEM/RE-EXAM EXAMINATION DEC/JAN 2024-25

Program: B.Tech Electrical | **Duration: 3 h**

Course Code: PC BTE 701 | **Maximum Points: 100**

Course Name: Electric Drives | **Semester: VII**

- Attempt *any five*
- Make suitable assumptions wherever necessary
- Note question paper is 2 pages long

Q.No.	Questions	Points	CO	BL	Module No.
Q1.(a)	Describe the four quadrants of a motor driving a hoist.	10	1	2	2
(b)	A drive has the following parameters J=10 Kg m2, T= 100-0.1 Nm, passive load torque TL=0.05 N-m where N is the speed in rpm. Initially the drive is operating in steady state. Now it is to be reversed. For this motor characteristic is changed to T=-100-0.1 N, Nm. Calculate the time of reversal.	5	1,2	4	2
(c)	A drive has the following equations for motor and load torques T= (1+2ω_m) and TL=3$\sqrt[2]{\omega_m}$. Obtain the equilibrium points and determine their steady state stability.	5	1	4	2
Q2.(a)	Explain with the help of a neat diagram closed loop control of multi motor driver with mechanically coupled load. Give an example were such drives are used.	10	2	1	4
(b)	How does a phase locked speed control scheme operate? Where such controls are required to be used?	6	2,4	1	4
(c)	What is the current status of dc and ac drives?	4	1	1	1
Q3.(a)	A rolling mill driven by thyristor converter fed dc motor operates on a speed reversing duty cycle. Motor field current is maintained constant at the rated value. Moment of inertia referred to motor shaft is 10,000 Kg m2. Duty cycle consists of the following intervals: (i) Rolling at full speed (200 rpm) and at constant torque of 25,000 Nm for 10s. (ii) No load operation for 1 s at full speed. (iii) Speed reversal from 200 to -200 rpm in 5 s. (iv) No load operation for 1 s at full speed. (v) Rolling at full speed (200 rpm) and at constant torque	8	2	4	3

END SEM/RE-EXAM EXAMINATION DEC/JAN 2024-25

	of 20,000 Nm for 15s. (vi) Speed reversal from 200 to -200 rpm in 5 s. (vii) No load operation at full speed for 1 s. Determine torque and power rating of the motor				
(b)	Draw the equivalent circuit of a 3φ induction motor and explain its operation during two lead and three lead ac dynamic braking. Give the torque equation and also speed torque characteristic for the same. Make comment which method is better.	12	3	1,3	6
Q4(a)	Draw and explain the block diagram of closed loop control of 3φ induction motor using V/f control.	10	3	2	6
(b)	A 230 V, 500 rpm, 100A separately excited dc motor has an armature resistance of 0.1 Ω. The motor is driving under rated condition, a load whose torque is constant and independent of speed. The speed below the rated speed are obtained with armature voltage control and speed above rated speed are obtained by field control. (i) Calculate terminal voltage when speed s 400 rpm. (ii) By what amount should flux be reduced to get 800 rpm?	10	3	4	5
Q5(a)	What are the similarities between brushless dc motor and a self-controlled synchronous motor drive?	8	3	2	7
(b)	A 1φ fully controlled rectifier is feeding the armature of the separately excited motor. With the help of neat waveform explain the operation of the motor during ;(i) Mode I, (ii) Mode II and (iii) Mode III. Also explain the condition for Mode IV operation of the motor.	12	3	2	5
Q6(a)	Explain with the help of a neat diagram operation of the simultaneous dual converter controlling separately excited motor. Compare simultaneous dual converter with zero circulating current dual converter.	12	3	2	5
(b)	Discuss the static resistance control of a 3φ slip ring induction motor.	8	3	2	6
Q7(a)	What is slip recovery scheme? Discuss the static Scherbius drive. Derive the torque expression and draw the speed torque characteristic.	10	3	2	6
(b)	Explain the operation of a closed control scheme with inner current control loop. What are various functions of the inner current control loop?	10	1	3	4

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End semester/~~Re-Examination~~ December/~~January~~ 2024-2025

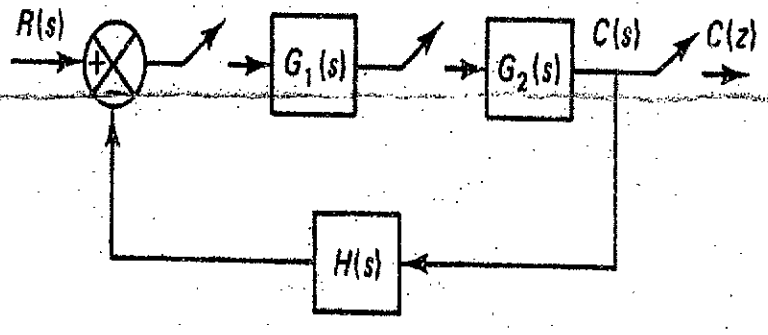
Program: B. Tech Electrical **Duration: 3 Hr**

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

Course Name: Digital Control Design **Semester: VII**

Note: Question 1 is compulsory. Solve ant four questions from the remaining six

Assume suitable data if required.

Q. No	Questions	Points	CO	BL	Mod. No
1	Answer any four a. Discuss separation principle for controller with observer. b. Compare different s plane to z plane mapping techniques c. Derive transfer function of discrete PID controller d. Discuss how Nyquist stability criteria is applied in z domain e. What is controllability? Compare Kalman and Gilbertz tests for checking controllability	20	1-3	1,2	6 2 1 3 5
2 a	A discrete time system is described by the following transfer function $T(z) = \frac{Y(z)}{R(z)} = \frac{1}{z^2+\frac{3}{4}z+\frac{1}{8}}$ Obtain y[n] if the input is 1. Impulse 2. Unit step.	5	1	3	2
b	Find C(z) for the following system if $G_1(s)=1/s$, $G_2(s)=s/(s+2)$ and $H(s)=1/s$ for unit step input. Assume sampling period =1sec 	5	1	3	2
c	Discuss various parameters considered for selecting sampling rate.	5	1	1,3	1

	Select the sampling frequency for the following system which is to be digitally controlled $$H(s) = \frac{25}{s^2 + 5s + 25}$$ Justify your answer				
d	Determine the steady state errors to unit step and unit ramp inputs for unity feedback system if forward transfer function is $$G(s) = \frac{(z + 0.1)}{z(z - 0.7)(z - 0.9)}$$	5	1	2	1
3 a	Determine the range of the parameter "a" for the closed loop unity feedback system to be stable if the loop gain is $$G(z) = \frac{1.1(z - 1)}{(z - a)(z - 0.8)}$$	06	2	3	3
b	Use Jury criterion to determine stability if the characteristic equation is $$z^5 - 0.25z^4 + 0.1z^3 + 0.4z^2 + 0.3z - 0.1 = 0$$	06	2	3	3
c	Design dead beat controller for a unity feedback system and unit step input if the plant transfer function is given by $$G_p(z) = \frac{0.02(z + 0.1)(z + 3)}{z(z - 1)(z - 0.2)(z - 0.4)}$$ Validate the controller function	08	2	3	3
4 a	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 $$x[k+1] = \begin{bmatrix} 0.3 & -0.1 \\ 0.1 & 0.22 \end{bmatrix} x[k]$$	10	3	1,3	4
b	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]	10			

	Obtain $x(k)$ *and* $y(k)$ if input is unit step. The initial state is given by $x(0) = \begin{bmatrix} x_1(0) \\ x_2(0) \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$				
5 a	What is set point tracker? Discuss the process of designing set point tracker. For the following system design state feedback controller so that output follows step input with desired closed loop poles at 0.3 and 0.4 $x(k+1) = \begin{bmatrix} 0 & 1 \\ -0.38 & 1.38 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$ $y(k) = [0.008 \quad 0.069] x(k)$	12	3	1,3	5
b	For the following system design controller for placing the desired poles at z=0.5 and z=0.6 The system equations $x(k+1) = \begin{bmatrix} -1 & -1 \\ 0 & -2 \end{bmatrix} x(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$ $y(k) = [1 \quad 0] x(k)$	8	3	3	5
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 $y[k] = [1 \quad 0] x[k]$	12	3	3	6
b	What is reduced order observer? Explain the design process of reduced order observer.	08	3	1	6
7	Compare state feedback controller with output feedback controller. Why pole placement method cannot be used while designing output feedback controller. Design output feedback controller for the system with two desired poles at z=0.2 and z=0.1 and state equations as $x(k+1) = F\,x(k) + g\,U(k)$ *and* $y(k) = Cx(k)$ where, $F = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & 0 & 0 \end{bmatrix}$, $g = \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \end{bmatrix}$	20	3		7

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End Semester Examination /~~Re-Examination~~

December-2024 / ~~January 2025~~

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

Class: **B.TECH.** Semester: **VII** Program: **B.TECH (Electrical)**

Name of the Course: **Electrical Vehicle System Design** Course Code: **PE-BTE-709**

Instructions:

- **Solve Any Five 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.

Q. No	Description of question	Max. Marks	CO
Q.1a	Discuss in brief the history of electric vehicle.	05	04
Q.1b	What are the advantages and disadvantages of electric vehicles?	05	04
Q.1c	Elaborate classification of charging stations.	05	05
Q.1d	What is battery management system (BMS) used in EV?	05	03
Q.2a.	Draw the architecture of EV and discuss the major component.	10	01
Q.2b.	Compare the torque speed characteristics of IC engine and EM. Discuss the suitability of EM used as prime mover in electrical vehicle.	10	01
Q.3 a)	Compare the fast charging and slow charging. Discuss the associated power quality issues with the fast charging.	10	03
Q.3 b.	An electric vehicle has the following parameter values: m=800 kg, C_D=0.2, A_F=2.2 m^2, C_0=0.008, C_1=1.6*10^{-6} s^2/m^2 .Also, take density of air ρ=1.18 kg/m^3, and acceleration due to gravity g=9.81 m/s^2. The vehicle is on level road. It accelerates from 0 to 65 mph in 10 s, such that its velocity profile is given by $v(t) = 0.29055t^2$ for $0 \le t \le 10$ s (a) Calculate $F_{TR}(t)$ for $0 \le t \le 10$ s. (b) Calculate $P_{TR}(t)$ for $0 \le t \le 10$ s. (c) Calculate the energy loss due to non-conservative forces E_{loss}.	10	01

Q.4 a	What is the series HEV architecture? Discuss its operation modes.	**10**	**02**
Q.4 b	Compare the PMSM and SRM motors used for EV applications.	**10**	**03**
Q.5 a	What is power train in EV. Discuss the role of power converter.	**10**	**03**
Q.5 b	What is regenerative braking in EV? Discuss the regenerative braking of three phase induction motor with torque speed characteristics.	**10**	**05**
Q.6 a	Discuss the V/F control of AC drive (induction motor) in closed loop mode.	**10**	**05**
Q.6 b	Draw the block diagram and discuss the vector control of permanent magnet synchronous motor.	**10**	**01**
Q.7a	Compare batteries and ultra-capacitor used in Electrical Vehicle based on following parameters: i) Cycle life ii) Efficiency iii) Specific power iv) Specific energy	**08**	**02**
Q.7b	What is the need of EV charging protocols? Enlist the names of protocols used in India.	**08**	**03**
Q.7c	What is the need of gearbox used in electrical vehicle?	**04**	**02**

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END SEM/~~RE-EXAM~~ EXAMINATION DEC/~~JAN~~ 2024-25

Program: Electrical

Course Code: PE-BTE705

Course Name: Restructuring and Deregulation of Power System

Duration: 3h

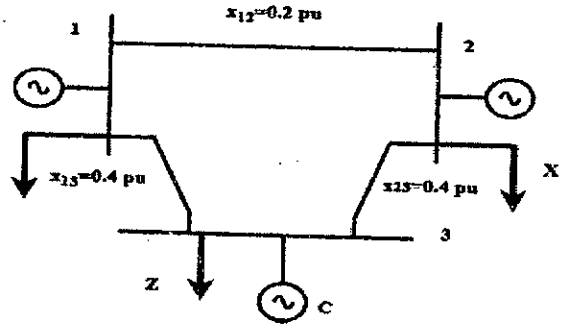
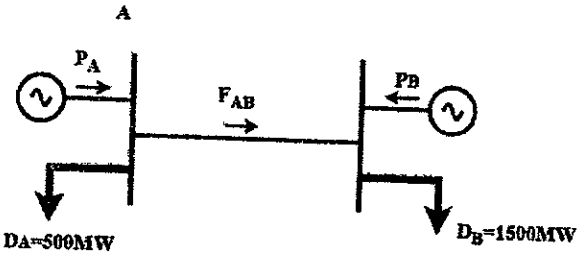
MaximumPoints: 100

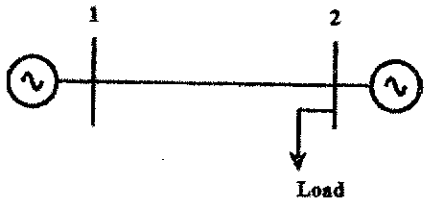
Semester: VII

- Attempt ***any five***
- Make suitable assumptions wherever necessary
- Note question paper is four page long

Q.No	Questions	Points	CO	BL	Module
Q1.(a)	A manufacturer estimates that its variable cost for manufacturing a given product is given by the following expression: $C(q) = 70q^2 + 2100q$ [₹] where C is the total cost and q is the quantity produced a. Derive an expression for the marginal cost of production b. Derive expressions for the revenue and the profit when the widgets are sold at marginal cost.	5	1	4	1
(b)	Identify the four distinguishing features of electricity which makes it different from other commodities.	5	1	2	1
(c)	Compare single buyer model of competition with wholesale model of competition. Also draw neat schematics for the same	5	1	2	1
(d)	The Amazing Steel Company is a consumer of electrical energy and Borduria Power is a generating company. In order to insulate themselves from the vagaries of the price on the Bordurian electricity market, these companies have signed a contract for difference for 100 MWh at 10 ₹/MWh. Trace the flow of power and money when the price of electrical energy on the Bordurian electricity market is: 1.) 9 ₹/MWh 2.) 10 ₹/MWh	5	1	4	1
Q2.(a)	Describe the characteristics of forward contracts, futures contracts, and option contracts.	12	2	2	2
(b)	A small power system consists of two buses connected by three transmission lines. Assuming that this power system must be operated according to the N-1 security criterion and that its operation is constrained only by thermal limits on	8	3	4	6

	the transmission lines, calculate the maximum power transfer between these two buses for each of the following conditions: (a). All three lines are in service. Two of them have a continuous thermal rating of 300 MW and the third is rated at 400 MW. (b). All three lines are in service. All of them have a continuous thermal rating of 400 MW. However, during emergencies, they can sustain a 10% overload for 20 min. The generating units on the downstream bus can increase their output at the rate of 10 MW per minute. (c). Same conditions as in (c) except that the output of the downstream generators can only increase at the rate of 6MW per minute. (d). Low temperatures and high winds improve the heat transfer between the conductors and the atmosphere. Assume that this dynamic thermal rating increases the continuous and emergency loadings of (c) by 12%.				
Q3.(a)	The inverse demand function for a group of consumers for a given type of widget is given by the following expression: $\pi = -10q+2000$ ₹, where q is the demand and π is the unit price of the product. The supply function for the widget market is given as: $q=0.2\pi -40$. 1.) Calculate demand and price at market equilibrium and global welfare. 2.) For the price of 1000 ₹/unit, calculate the consumption, the consumer gross surplus, revenue collected by the producer and consumer net surplus. 3.) If the price changes by 20% calculate the change in the consumption and the change in the revenue collected by the producers.	12	2	4	2
(b)	Explain why spot market is required? Who manages this market? Who can participate in this market? When gates of his market are closed?	8	2	2	4
Q4.(a)	Electricity Act 2003 paved initiated the reforms in Indian power sector. Describe the key highlights of this act.	8	1	2	7

(b).	Consider the power system shown below. Assuming that the only limitations imposed by the network are imposed by the thermal capacity of the transmission lines and that reactive power flows are negligible, check that the sets of transactions shown in Table are simultaneously feasible. All transmission line can carry maximum power of 250 MW.  Table Seller / Buyer / Amount (MW): B / X / 200; A / Z / 400; C / Y / 300	12	2	3	2
Q5(a)	Name and explain the typical characteristics of transmission as a standalone business?	10	2	3	7
(b)	Explain what ancillary services are and why these services are needed? List different types of ancillary services. How much and from whom these services should be bought?	10	3	1,2	6
Q6.(a)	Consider the two-bus power system shown in figure below. The marginal cost of production of the generators connected to buses A and B are given respectively by the following expressions:  $MC_A = 24 + 0.03P_A$ ₹/MWh $MC_B = 15 + 0.025P_B$ ₹/MWh	12	2	4	4

	Assume that the demand is constant and insensitive to price, that energy is sold at its marginal cost of production and that there are no limits on the output of the generators. Calculate the price of electricity at each bus, the production of each generator and the flow on the line for the following cases: (a). The line between buses A and B is disconnected (b). The line between buses A and B is in service and has an unlimited capacity, but the maximum output of Generator B is 1400MW. (c). The line between buses A and B is in service and has an unlimited capacity, but the maximum output of Generator B is 1000 MW. The output of Generator A is unlimited. (d). The line between buses A and B is in service but its capacity is limited to 200MW. The output of the generators is unlimited. (e) Find the merchandising surplus for part (d).				
(b)	For the system shown below.  The incremental costs for the two plants are: $MC_1 = 15 + 0.08P_1$ ₹/MWh $MC_2 = 13 + 0.1P_2$ ₹/MWh The transmission line loss formula indicates that for a transfer of 150 MW, a loss of 15 MW occurs. If λ=25₹/MWh , find (a)Loss coefficients (b) P1 and P2 for the minimum fuel cost (c) power supplied to the load (d) loss in transmission line.	8	2	4	3
Q7.(a)	Discuss why physical transmission right is essential for trading electricity? How can these rights can be acquired? Demonstrate with the help of an example how a player of a market can abuse market power by purchasing physical transmission rights? Suggest, what can be done to avoid its misuse?	10	3	1,2	4
(b)	Investigate the investor perspective to invest into new generation plant. Discuss what difficulties investor may face to build the new plant.	10	1	2	5

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Academic Year 2024 – 25 [First Half]
Regulation – 2018
End Semester Examination [December 2024] / ~~Re-Examination~~ [~~January~~ 2025]

Program: B. Tech. Electrical Engineering
Course: Engineering Economics [Open Elective]
Course Code: OE –BTE705

Semester: VII
Total Points: 100
Question Paper Set–II

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

CO: Course Outcomes **BL:** Bloom's Taxonomy Level

Q. No.	Question	Points	CO	BL
1.	a. Discuss the flow of goods, services, resources and money payments in a simple economy with the help of a suitable diagram.	05	2	L2
	b. Explain the terms *breakeven analysis* and the *margin of safety*.	05	2	L2
	c. List and explain the different situations deserving *elementary economic analysis*.	05	2	L3
	d. Two alternatives are under consideration for a tapered fastening pin. Either design will serve the purpose and will involve the same material and manufacturing cost except for the lathe and grinder operations. Design A will require 16 hours of lathe time and 4.5 hours of grinder time per 1,000 units. Design B will require 7 hours of lathe time and 12 hours of grinder time per 1,000 units. The operating cost of the lathe including labour is Rs. 200 per hour. The operating cost of the grinder including labour is Rs. 150 per hour. Which design should be adopted if 1,00,000 units are required per year and what is the economic advantage of the best alternative?	05	3	L3
2.	a. Two possible routes for laying a power line are under study. Data on the routes are as follows:	10	1	L3

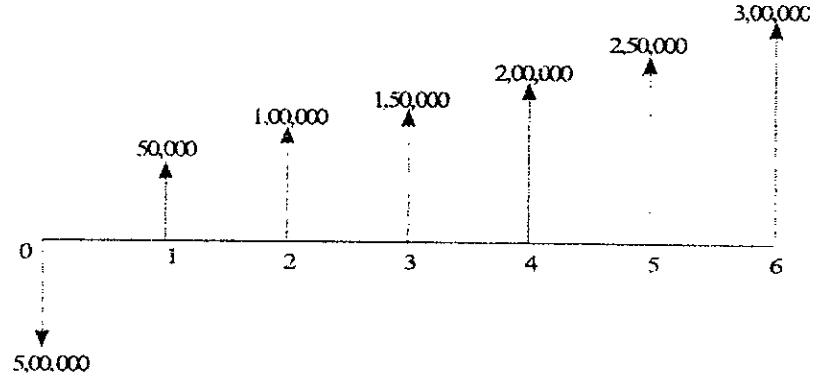
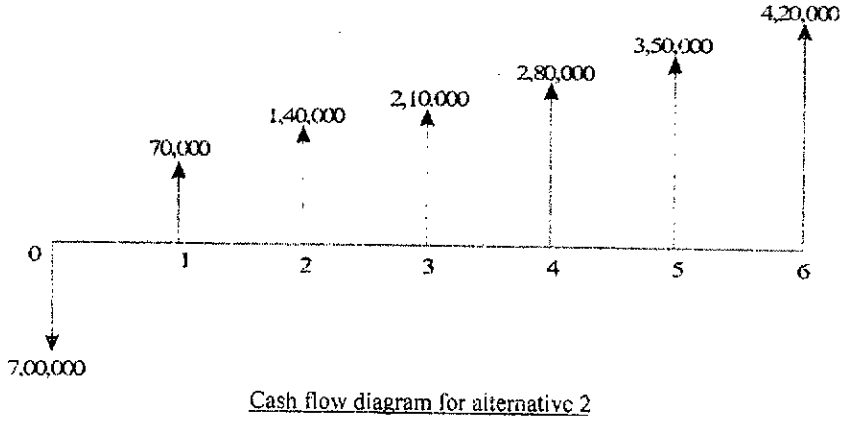
		Around the lake	*Under the lake*
Length		15 km	5 km
First cost	(Rs.)	1,50,000/km	7,50,000/km
Useful life	(years)	15	15
Maintenance cost	(Rs.)	6,000/km/yr	12,000/km/yr
Salvage value	(Rs.)	90,000/km	1,50,000/km
Yearly power loss	(Rs.)	15,000/km	15,000/km

If the rate of interest is 15%, then using *annual equivalent method* suggest whether the power line be routed around the lake or under the lake?

	b. A firm has identified three mutually exclusive investment proposals whose details are given below. The life of all the three alternatives is estimated to be five years with negligible salvage value. The minimum attractive rate of return for the firm is 12%. Find the best alternative based on the *rate of return method* of comparison.	**10**	**1**	**L3**
3.	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. Determine the depreciation charge and book value at the end of various years using *the sum-of-the-years-digit method of depreciation* with an interest rate of 12%, compounded annually	**10**	**2**	**L2**
	b. In a particular locality of a state, the vehicle users take a roundabout route to reach certain places because of the presence of a river. This results in excessive travel time and increased fuel cost. So, the state government is planning to construct a bridge across the river. The estimated initial investment for constructing the bridge is Rs. 40,00,000. The estimated life of the bridge is 15 years. The annual operation and maintenance cost is Rs. 1,50,000. The value of fuel savings due to the construction of the bridge is Rs. 6,00,000 in the first year and it increases by Rs. 50,000 every year thereafter till the end of the life of the bridge. Check whether the project is justified based on BC ratio by assuming an interest rate of 12%, compounded annually.	**10**	**1**	**L3**
4.	a. Distinguish between *breakdown maintenance* and *preventive maintenance*.	**05**	**2**	**L5**
	b. A diesel engine was installed 10 years ago at a cost of Rs. 50,000. It has a present realizable market value of Rs. 15,000. If kept, it can be expected to last five years more, with operation and maintenance cost of Rs. 14,000 per year and to have a salvage value of Rs. 8,000 at the end of the fifth year. This engine can be replaced with an improved version costing Rs. 65,000 which has an expected life of 20 years. This improved version will have an estimated annual operating and maintenance cost of Rs. 9,000 and ultimate salvage value of Rs. 13,000. Using an interest rate of 15%, make an *annual equivalent cost analysis* to determine whether to keep or replace the old engine.	**05**	**3**	**L5**
	c. 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, calculate the economic life of machine B and the corresponding annual equivalent total cost. Suggest which machine should be purchased? Assume the scrap value of each of the machines is negligible at any year.	**10**		

Alternative

	A1	*A2*	*A3*
Investment	Rs. 1,50,000	Rs. 2,10.000	Rs. 2,55,000
Annual net income	Rs. 45,570	Rs. 58,260	Rs. 69,000

5.	a. Investment proposals A and B have the net cash flows as follows: *Proposal* / *End of years* 0 / 1 / 2 / 3 / 4 A (Rs.) / −10,000 / 3,000 / 3,000 / 7,000 / 6,000 B (Rs.) / −10,000 / 6,000 / 6,000 / 3,000 / 3,000 Compare the *present worth* of A with that of B at i = 18%. Which proposal should be selected?	**10**	**3**	**L3**
	b. The cash flow diagrams of two mutually exclusive alternatives are given below.  Cash flow diagram for alternative 1  Cash flow diagram for alternative 2 Select the best alternative based on *future worth method* at $i = 8\%$.	**10**	**3**	**L3**
6.	a. A manufacturer of TV buys TV cabinet at Rs. 500 each. In case the company makes it within the factory, the fixed and variable costs would be Rs. 4,00,000 and Rs. 300 per cabinet respectively. Should the manufacturer make or buy the cabinet if the demand is 1,500 TV cabinets?	**05**	**2**	**L3**
	b. Define the term value and describe its different types briefly.	**05**	**2**	**L3**
	c. Briefly explain the various criteria for *make or buy decisions*.	**10**	**2**	**L2**

7.	a. Explain the different types of models of inventory system in brief.	**10**	**2**	**L5**
	b. The annual demand for a component is 30,000 units. The carrying cost is Rs. 2.00/unit/year, the ordering cost is Rs. 100.00/order, and the shortage cost is Rs. 12.00/unit/year. Find the optimal values of the following for the *purchase model with shortages inventory system*: *i.* Ordering quantity *ii.* Maximum inventory *iii.* Maximum shortage quantity *iv.* Cycle time *v.* Inventory period (t1) *vi.* Shortage period (t2)	**10**	**2**	**L5**

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END SEM/~~RE-EXAM~~ EXAMINATION DEC/~~JAN~~ 2024-25

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

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

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

Notes:

- **Question 1 is compulsory.**
- **Attempt any 4 of remaining 6 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. Describe the physical components of IoT. Explain the role of sensors, actuators, and communication devices in an IoT system.	5	1	2	1
	b. Compare and contrast the architecture and protocols used in IoT and M2M. How do these differences affect data communication and system scalability?	5	2	4,5	2
	c. Discuss the criteria for selecting the right sensor for a specific use case. Provide examples of use cases and justify your sensor choices.	5	3	3,5	4
	d. Implement a real-time monitoring system for temperature and humidity using Python and Raspberry Pi. Explain the code and system setup.	5	4	3,6	7
2.	a. Discuss Websocket-based communication API.	6	2	2	1
	b. Explain transport layer protocol with example.	6	2	2	1
	c. Explain how Software-Defined Networks (SDN) support the development and operation of IoT systems. Discuss the advantages of SDN in managing IoT traffic.	8	3	2,4	2
3.	a. Explain the role of routing protocols in wireless sensor networks. Discuss the key differences between proactive, reactive, and hybrid routing protocols.	8	2	2,4	3
	b. Distinguish between fixed assignment and dynamic assignment in contention free medium access with example.	6	2	2	3
	c. Discuss the characteristics of MAC protocol in sensor network.	6	2	2	3

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END SEM/RE-~~EXAM~~ EXAMINATION DEC/~~JAN~~ 2024-25

4.	a. Describe the key elements of IoT, including sensors, connectivity, and the application layer. Explain their roles in building an IoT system.	8	1	2	4
	b. Discuss the sensor types and its characteristics.	6	3	2	4
	c. Explain industrial sensors with example.	6	3	2	4
5	a. Describe design challenges of IoT.	8	3	2	5
	b. Describe development challenges of IoT.	8	3	2	5
	c. Describe privacy challenge of IoT.	4	3	2	5
6	a. Explain the concept of home automation using IoT. Describe its key components and how it enhances convenience and energy efficiency.	10	1,3	2,4	6
	b. Explain how IoT technology used to enable the agricultural industry to increase operational efficiency, lower costs, reduce waste, and improve the quality of their yield.	10	4	2	6
7.	a. Explain with an example difference between a python module and a package?	8	4	3	7
	b. Design an automatic lightening system with LDR, Light and Arduino and write a python program to support the working of that design.	8	4	6	7
	c. Write a Python program to concatenate two strings.	4	4	3	7