Exam.		Back	
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics (CE655)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. State and explain principles of engineering economics. [4]

2. Define time value of money, nominal and effective interest rate. Calculate future sum at the end of 5th year when monthly deposit is Rs 6,000 for 3 years that earns 7% interest per year. [3+3]

3. a) Make investment decision for the following project by using (i) IRR (ii) B/C (iii) Discounted Payback methods. [4+4+4]

   Initial cost = Rs. 4,00,000
   Annual Revenue = Rs. 1,60,000 for the 1st year and decreases by Rs. 10,000 thereafter
   Annual Expenses = Rs. 40,000 for the 1st year and increases by Rs. 5,000 thereafter
   Salvage value = Rs. 1,00,000
   Life year = 8
   MARR = 9% per year

   b) What do you mean by financial and economic analysis? Briefly explain the concept of lifecycle costing. [2+2]

4. a) Compare following two projects by IRR method when i = 10% per year. [4]

	Initial Cost	Annual revenue	Annual cost	Salvage value	life year
Project A	5,00,000	2,00,000	50,000	80,000	7
Project B	7,00,000	3,00,000	1,00,000	1,50,000	7

   b) Select the best project by using repeatability assumption when MARR = 13% [4]

	Initial cost	Annual revenue	O and M	Life year	Salvage value
Project X	4,00,000	1,75,000	50,000	4	1,00,000
Project Y	7,00,000	2,50,000	70,000	6	1,50,000

   c) Define independent and contingent projects. Find Present worth from annual cash flow series of Rs. 5,000 forever when i = 8% per year. [1+1+2]

5. What do you mean by replacement analysis and economic service life? What are the procedures for replacement when planning horizon is infinite and finite? Calculate AECs from the following information and determine economic service life. [2+2+2+6]

   I = 18,000
   N = 8 years
   O and M = 3,000 for the 1st year and increases by 15% thereafter
   S = Decline by 20% each successive year over than previous price
   MARR = 12% per year

6. a) Explain the concept of scenario and decision tree analysis. If 20 watt CFL bulb price is Rs. 280 and 100 watt filament bulb price is Rs. 30 at market but their lighting power is equal. Which bulb do you prefer to use in your house when electricity cost is Rs. 12 per unit? [6]

   b) Perform sensitivity analysis for the following project over range of ±30% in parameters; (i) Initial investment (ii) Annual revenue (iii) life year [6]

Initial Cost	Rs. 5,00,000
Annual revenue	Rs. 1,20,000
Salvage value	Rs. 80,000
Life year	6 year
MARR	10% per year

7. a) Define depreciation. What are the advantages of depreciation concept? Your college is considering purchase vehicle of Rs. 4,00,000 that assigned to 5 years useful life and expected salvage value is Rs. 1,00,000. Calculate depreciation for each year by using declining balance and MACRS. [1+2+3+3]

   b) What do you mean by tax, personal tax and corporate tax? Develop a model to calculate after tax cash flow. [1+1+1+2]

8. What is inflation? List out the impact of inflation. Calculate the rate of inflation when CPI moves from 100 to 250 over three years. [1+2+1]

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4

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics (CE655)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. Define term Engineering economy. Explain principles of engineering economy. [1+3]

2. a) If you make equal monthly deposits of Rs. 5000 into the bank for 10 years, saving accounts that pays interest rate of 6% compounded monthly, what would be the amount at the end of 15 years? [4]

   b) How much rupees should you deposit now so that you will be able to draw Rs.5000 at the end of this month which increases by 2 percent per month for 15 years. Bank interest rate is 5% per year. [4]

3. a) Explain any two drawbacks of IRR with example. Differentiate between Economic analysis and financial analysis. [3+3]

   b) Evaluate the project by using AW formulation of the project at i = 12%. [4]

EOY	0	1	2	3	4	5
Cash flow	-3000	800	1000	1100	1210	1464

   c) Calculate the ERR of the following cash flow. MARR = 12%, reinvestment rate = 14%. [6]

EOY	0	1	2	3	4	5
Cash flow	-100,000	25,000	40,000	-10,000	50,000	50,000

4. a) Choose the best project among these alternatives using IRR, if MARR = 15% and study period is 10 years. Salvage value is 20%. [6]

Project	A	B	C	D
First Cost Rs.	900	1500	2500	4000
Annual Revenue Rs.	150	276	400	925

   b) Consider the following two mutually exclusive alternatives; recommend the best alternatives using repeatability assumptions. MARR = 15% [16]

	Project X (Rs.)	Project B (Rs.)
Initial Cost	100,000	150,000
Annual Cost	25,000	12,000
Salvage Value	40000	50000
Useful Life	6 years	10 years

1

5. Define defender and challenger and Explain economic service life. Company X is going to purchase a router having initial cost Rs.18,000 having salvage value of Rs.12000 at the end of first year and decreases by 20% each year then after for remaining useful life. Annual operation and maintenance cost is Rs. 5000 in first year and increases by Rs.2000 each year. Its useful life is 6 years. Calculate economic service life of the router. [2+2+8]

6. a) A project costs Rs. 125,000 with annual revenue of Rs.65,000 and annual cost of Rs.35,000. Salvage value will be 8% of the initial investment. Perform Sensitivity analysis using PW formulation over a range of ±40% in i) Initial Investment ii) Annual Revenue iii) Useful Life and iv) MARR. Draw the sensitivity diagram and indicate the most sensitive and least sensitive parameters. [6+2]

   b) Define breakeven point and breakeven volume. How does interest rate change affect the project? [2+2]

7. a) Compute the annual depreciation allowances and the resulting book value using the double declining balance method with Switch over to straight line method.
   Cost of asset = Rs. 100,000, Useful life = 5 years, Salvage Value = 20000 [6]

   b) A company bought a machine at Rs 25000 which is expected to produce benefit of Rs 8000 per year for five years. Its salvage value at the end of five years is Rs 10000. Calculate after tax cashflow if Tax rate is 40% and depreciation is on Sinking fund method. I = 20% [6]

8. Define inflation. Calculate IRR if MARR = 12% and inflation rate is 8%. [1+3]

Year	0	1	2	3	4
Constant Dollar	-6000	1500	2000	2500	3000

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2

Subject: - Embedded System *(CT655)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. Define Embedded System. Clarify the statement 'Digital Camera is a good example of an Embedded System'. In RTOS, explain context switching with suitable diagram. [1+3+4]

2. Design a single purpose processor to determine the value of x to the power n. Start the design from the function computing the desired result, FSMD, datapath and controller. [8]

3. Explain the design flow of embedded software development. Explain in brief about programmer's view for general purpose processor. [4+4]

4. Define write ability and storage permanence of memory. Explain associative cache mapping technique with its merits and demerits. [3+5]

5. Describe two-level bus architecture in detail. Describe priority arbitration method and compare it with daisy-chain arbitration. [3+5]

6. Write any four differences between thread and process. Three Processes P1, P2 and P3 with estimated completion time 4, 10, 5 ms and priorities 1, 3, 2 respectively enters the ready queue together. A new process P4 with estimated completion time 3 ms and priority 0 enters the ready queue after 5ms of start of operation. Calculate WT, TAT for each process and calculate AWT and ATAT using preemptive priority based scheduling algorithms. [2+6]

7. What are the challenges of modeling a real physical system and how can you overcome it? Write an algorithm to implement the PID controller in software. [3+5]

8. Explain the importance of photolithography in IC manufacturing. Explain the two broad categories of Semi-Custom IC technology. [5+3]

9. Draw the circuit diagram of the minimum configuration for 8051 microcontroller to operate. Also show the connection of LED at P1.7 and switch at P1.1 in the same circuit. Using an Assembly language, generate a pulse of 75% duty cycle at pin P1.7 when the switch at 1.1 is ON. [4+4]

10. Write an algorithm and VHDL code for a custom processor that calculates Least Common Multiple (LCM) of two numbers as a finite state machine. [3+5]

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Exam.		Back	
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Embedded System (CT655)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. What is a design metric and explain the purposes of embedded system. Define task scheduling, list out its types and explain the factors affecting on selection of scheduling algorithm. [4+4]

2. Design a single-purpose processor that outputs Fibonacci numbers up to 'n' places. Start with a function computing the desired result, translate it into a state diagram, and sketch a probable datapath. [8]

3. Define pipelining and show 6 stage pipeline concepts. Explain DSP with characteristics and advantages. [4+4]

4. Explain the operation of storing data in One Time Programmable ROM. Why it can't be reprogrammed? Compose 1K × 8 ROMs into a 4K × 8 ROM. [2+2+4]

5. What is arbitration? Explain priority arbitration with the help of a block diagram and steps along with its types. [2+6]

6. Define threads and differentiate between user level thread and kernel level thread. Three processes with IDs P1, P2, P3 with estimated completion time 6, 8, 2 milliseconds respectively enters the ready queue together in the order P1, P2, P3. Process P4 with the estimated execution time 4 milliseconds enters the ready queue after 1 millisecond. Calculate the waiting time and Turn Around Time (TAT) for each process and the average waiting time and TAT in the non-preemptive shortest-job-first scheduling. [3+5]

7. Draw the block diagram of closed-loop control system for speed control of an automobile and explain the conditions for no unbound and no oscillation showing all the design steps. [8]

8. Show various steps of photolithography process using appropriate diagrams. Describe briefly about Full custom VLSI technology. [4+4]

9. Explain the addressing modes used in 8051 microcontroller with example. Write an assembly language programming to blink the 8 Led connected at Port 2 of the 8051 microcontroller. [4+4]

10. Explain COMPONENT with its declaration. Write a VHDL code for a JK flip-flop using PROCESS. [3+5]

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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Propagation and Antenna (EX653)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. Explain retarded potential and their importance. Describe infinitesimal dipole with the help of suitable diagram, mathematical relations and the field pattern. [2+6]

2. Explain the following antenna parameters. [2+2+2]

   (a) Radiation pattern (b) Antenna gain (c) Polarization

3. State following antenna theorems: (a) Reciprocity (b) Compensation [2+2]

4. What is Skip distance? Derive the relationship between critical frequency (f_{cr}) and Skip distance (D) assuming flat earth for both antennas. [7]

5. A parabolic reflector antenna having antenna efficiency 75% is designed for 5GHz resonance frequency with 3dB waveguide loss. If Effective Isotropic Radiated Power (EIRP) is calculated 50dBW and transmitting power is 600W calculate its diameter. [8]

6. The antenna of a TV transmitter is located at a height of 125m above ground level. Calculate the distance up to which the LOS communication is possible if the height of receiving antenna is to be 9m. [6]

7. Describe the construction, working principle, and design of Yagi-Uda antenna with necessary diagrams. [8]

8. What is a radio frequency spectrum? Give major propagation characteristics of VHF and UHF bands. [2+6]

9. Define the following: (a) MUF   (b) Virtual height

10. Draw the optical fiber communication system. What are the advantages and disadvantages of optical fibers over metal wire communication? [3+6]

11. Write short notes on: (Any four) [4×4]

    a) Helical antenna
    b) Super refraction
    c) Knife edge diffraction
    d) Numerical aperture (NA)
    e) Logarithmic antenna

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7

Exam.		**Back**	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Propagation and Antenna *(EX653)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. What is an antenna? Explain how electromagnetic waves are generated by a conductor. [2+4]

2. Derive an expression for the total field in case of two isotropic point sources with equal amplitude and opposite phase. [6]

3. Name the parasitic elements used in Yagi-Uda array. Explain their significance in the array. Compare Yagi-Uda antenna with Log periodic dipole array. [1+2+4]

4. Explain skip distance and derive the expression for skip distance (D) for flat earth surface. [8]

5. Describe the antenna gain, antenna efficiency and directivity of antenna with mathematical derivation if necessary. [6]

6. Find the received power (in dBm) at a distance of 0.5 km over a free space 1 GHz circuit consisting of a transmitting antenna with 25 dB gain and a receiving antenna gain of 20 dB. The power radiated by the transmitting antenna is 150 W. [5]

7. What is ionosphere? Explain the ionosphere wave propagation showing its different layers. [1+5]

8. List the major characteristics of Marconi antenna with necessary figures. [6]

9. Discuss loss or signal attenuation in an optical fiber with respect to absorption, scattering and bending losses. [8]

10. Define free space communication. Derive complete equation including path loss using friis space communication. [2+8]

11. Write short notes on: (any three) [3×4]
    a) Parabolic reflector antenna
    b) Compare between broadside array and endfire array
    c) Knife edge diffraction phenomenon
    d) Optical source and Optical detector

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8

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEL, BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Signal Analysis (EX651)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. Differentiate between energy signal and power signal.Show by giving suitable example that power of the energy signal is zero and energy of the power signal is infinite. [2+5]

2. a) Derive necessary condition for a discrete time signal to be periodic. [3]

   b) Determine whether the following discrete time signals are periodic or not [4]

   (i) SPn 5n

   (ii) $\cos\left(\dfrac{2\pi n}{5}\right) + \cos\left(\dfrac{2\pi n}{7}\right)$

3. a) Derive the expression to compute Fourier series coefficients of exponential Fourier series. [5]

   b) Explain the Dirichel Conditions for convergence of Fourier series. [3]

4. a) State and prove time shifting and time scaling properties of continuous time Fourier series. [4]

   b) Find Fourier series coefficient of discrete time periodic signal

   $x[n] = \sin w_0 n$ where $w_0 = \dfrac{2\pi}{N}$

   Plot the signal when N = 5. [4]

5. How do you find the Fourier transform of periodic signals? Find the Fourier transform of continuous time rectangular pulse and constant amplitude A and explain the result. [5+5]

6. Show that convolution in time domain results multiplication in frequency domain using continuous time Fourier transform. Determine discrete time Fourier transform of the discrete time signal $x(n) = 2^n U[n]$ and also plot magnitude and phase spectrum. [5+5]

7. State and prove frequency shifting property of Fourier transform. [2+3]

8. What is aliasing? Determine the Nyquist rate for the continuous time signal $x(t) = 1 + \cos(2{,}000\pi t) + \sin(4{,}000\pi t)$ [2+4]

9. a) Derive convolution integral for continuous time LTI system. [6]

   b) Compute convolution sum of signal $x[n] = \{1, 2, 0, -1\}$ and $h[n] = \{2, 0, 2\}$. [7]

10. For a system characterized by linear constant coefficient difference equation: $y(n) = 0.3y(n-1)+x(n)$, find the transfer function, plot magnitude and find the impulse response of the system. [6]

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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Communication System I *(EX652)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ *Attempt __All__ questions.*
✓ *__All__ questions carry equal marks.*
✓ *The figures in the margin indicate __Full Marks__.*
✓ *Assume suitable data if necessary.*

1. Draw and explain block the diagram of analog communication system. [8]

2. What is impulse response? What are the conditions for distortionless transmission? Explain with necessary diagrams. [2+6]

3. Define energy spectral density and power spectral density function of a signal and hence derive the auto correlation function of white noise utilizing power spectral density. [4+4]

4. With waveforms and necessary derivation, explain Ring Modulator method of generating DSB-SC signal. [8]

5. An AM wave is represented by $s(t) = 5[1+ 0.6 \cos(6280t)] \cos(2\pi 10^4 t)$ volts, then find the followings: (a) Modulation Depth, (b) Maximum and Minimum Amplitude of AM wave, (c) Frequency components in modulated signal and their amplitudes, (d) Power dissipated across 1K Ohm resistor. [2+2+2+2]

6. What is QAM modulation, why is it necessary? Explain generation and detection of QAM wave. [3+4]

7. What are the essential components that constitute PLL? How can PLL be used to demodulate AM signal? [2+6]

8. Derive the time domain expression of single tone FM in terms of Bessel's function $J_n(\beta)$. Use the result to find the expression of average power of FM signal whose significant Bessel's coefficients are taken from ' - n' to ' + n'. [6+2]

9. An Armstrong FM modulator is required in order to transmit an audio signal of bandwidth 50 Hz to 15 KHz. The Narrow Band (NB) phase modulator used utilizes an oscillator providing carrier frequency $f_{c1} = 0.2$ MHz. The output of the NB phase modulator is multiplied by n_1 by multiplier and then passed to mixer with a local oscillator frequency $f_{c2} = 10.925$ MHz. The desired FM wave at the transmitter output has a carrier frequency $f_c = 90$ MHz and a frequency deviation $\Delta f = 75$ KHz, which is obtained by multiplying the mixer output frequency with n_2 by using another multiplier. Find n_1 and n_2. Assume that the NBFM signal at the output of NB phase modulator has modulation index, $\beta = 0.5$. [9]

10. Write short notes on following: (Any two) [4+4]

   a) FDMA in satellite communications
   b) Pre-emphasis and de-emphasis
   c) Superheterodyne radio Receiver

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Exam.		Back	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Communication System I (EX652)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. Distinguish between noise and interference? How their effects can be minimized? Also explain why modulation is needed in communication system. [4+2+2]

2. Define Hilbert Transform; describe it with mathematical expression and frequency response. Mention the properties of Hilbert Transform. Explain distortionless transmission channel with its frequency response. [3+2+3]

3. State and prove Rayleigh energy theorem for a given energy signal x(t). [2+6]

4. Find the time domain and frequency domain expressions for single tone DSB-FC AM modulated wave. Also, show the spectrum of the modulated signal. [3+3+3]

5. A cosine carrier of frequency 750 KHz is amplitude modulated by another cosine wave of frequency 325 Hz resulting in maximum and minimum carrier amplitudes of 110V and 90V respectively: [2+3+2]

   a) Draw the waveform of AM wave thus created.
   b) Write the expression of the resulting AM wave.
   c) Find the total power radiated and efficiency.

6. Explain the phase shift method of generation of SSB AM modulated wave. What are the pros and cons of this method? [6+2]

7. Explain the envelope detection method for the demodulation of AM wave with necessary conditions for time constants and waveforms. [4+2+2]

8. What is angle modulation? Find the time domain and frequency domain expression of single tone modulated FM signal. [2+3+3]

9. A 102.4 MHz carrier signal is frequency modulated by a 5 KHz sine wave. The resultant FM signal has frequency deviation of 75 KHz. Now, determine the followings: (a) carrier swing of FM signal, (b) the bandwidth occupied by FM signal and (c) modulation index. [3+3+3]

10. What is frequency division multiplexing (FDM)? Describe the FDM hierarchy in telephony. [2+5]

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12

Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Network (CT657)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt All questions.
✓ The figures in the margin indicate Full Marks.
✓ Assume suitable data if necessary.

1. Explain about the designed issues of Computer Network software. Distinguish between physical channel and physical layer.   [5+3]

2. What do you mean by switching in communication? Compare Virtual Circuit and datagram approach with suitable diagram.   [2+6]

3. Why do you think that the issues of media access is very important in data link layer? Explain about the operation of CSMA/CD. How can you make it more efficient?   [3+5]

4. Institute of Medicine has 4 colleges. They need to be connected in same network. Allocate following numbers of IP addresses: 25, 68, 19 and 50 to those colleges by reducing the losses. The IP address provided to you to allocate is: 202.61.77.0/24. List the range of IP Addresses, their network address, broadcast addresses and corresponding subnet mask.   [8]

5. What is congestion? What are the techniques for congestion control? Explain TCP three way handshaking process.   [1+3+4]

6. Differentiate following points in the context of layers of TCP/IP.   [3+2.5+2.5]

   a) SMTP and IMAP
   b) HTTP and DNS
   c) Port and socket

7. Why network layer is the key layer in OSI reference model? Describe the working principle of OSPF routing protocol.   [2+6]

8. Explain IPV6 with its frame format. What methods are used so that IPV6 and IPV4 networks are interoperable?   [4+4]

9. List the properties of secure communication. Encrypt and decrypt "BEX" using RSA algorithm.   [8]

10. Write short notes on: (Any Two)   [2×4]

    a) Medium Access Sub-layer
    b) DNS Queries
    c) Firewalls

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13

Subject: - Computer Network (CT657)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt _All_ questions.
✓ The figures in the margin indicate **_Full Marks_**.
✓ Assume suitable data if necessary.

1. What are the reasons for using layered protocols? Compare OSI reference model and TCP/IP model. [3+5]

2. Differentiate between wired and wireless media with their benefits and drawbacks. Discuss Packet and Circuit switching concepts with example. [3+5]

3. Explain different types of ALOHA. Differentiate between Token bus and Token ring networks. [4+4]

4. What are the factors effecting the Congestion? Explain the operation of Link State Routing Protocol. [3+5]

5. Compare IMAP and SMTP. How a request initiated by a HTTP client is served by a HTTP server? Explain. How HTTPS works? [3+3+2]

6. Explain Transmission Control Protocol with its Header Formate? Compare it with User Datagram Protocol. [6+2]

7. Compare the header fields of IPV6 and IPV4. Explain about the process to simplify the writing of addresses of IPV6? [4+4]

8. Compare symmetric key encryption method with asymmetric key encryption. Describe the operation of RSA algorithm. [3+5]

9. What are digital signatures? Explain the operation of Data Encryption Standard algorithm. [2+6]

10. Write short notes: (Any two) [4+4]
    a) HUB, Switch and Routers
    b) Firewalls and their types
    c) Flow control / Mechanism of DLL

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14

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE, BEL, BEX, BCT, BGE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Engineering Economics (CE655)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. Define Engineering Economics. Write down the principles of Engineering Economic Analysis. [4]

2. What is nominal and effective interest rate? Evaluate FW at the end of 10 years with 12% interest rate compounded monthly of a cash flow of Rs. 40,000 at the beginning of each year for 5 years. [2+4]

3. a) Use IRR method to evaluate following project when MARR is 15%. Make also unrecovered balance graph. [5]

EOY	0	1	2	3	4	5
Cash flow	-60,000	20,000	40,000	-40,000	50,000	70,000

   b) Your college is considering to purchase a vehicle of Rs. 3,00,000 expecting salvage value Rs 50,000 at the end of 10th year. The use of vehicle saves Rs. 80,000 per year. When it needs Rs. 20,000 operating cost for each year. Find: (i) Both type of B/C ratio by FW formulation (ii) both types of payback period. [4+4]

   c) Distinguish between financial and economic analysis. [2]

4. a) Compare the following two mutually exclusive projects by using (i) Co-terminated (ii) Repeatability assumption taking MARR = 8% [4+4]

	Project A	Project B
Initial cost	1,50,000	2,00,000
Annual revenue	90,000	1,00,000
Operating cost	20,000	20,000
Life year	4	6
Salvage value	80,000	1,20,000

   b) Define mutually exclusive, contingent and independent projects with suitable example. [3]

5. What are the procedure for replacement analysis when planning horizon is infinite? [4+8]

   Find economic service life from the following information.

   Initial cost = Rs 50,000

   Operation cost = Rs 10,000 for the 1st year and increases by 15% thereafter

   Salvage value = Decline each successive year by 20% over previous year.

   Useful life = 8 years

   MARR = 15%

6. Explain about the decision tree analysis. Perform sensitivity analysis of the following project over range of ±30% at an interval of ±10% in (i) Initial Investment (ii) Net Annual Revenue and (iii) Useful life. Use PW formulation. [2+10]

| Initial Investment (Rs)	1,00,000
Net Annual Revenue (Rs)	40,000
Salvage Value (Rs)	15,000
Useful life (years)	6
MARR (%)	10

7. Write down the causes for depreciation of assets. If a machine costing of Rs. 1,00,000 is purchased by expecting salvage value of Rs 20,000 at the end of 6th years. Calculate the depreciation amount for each years by SOYD and straight line method. [2+5+5]

8. Define constant dollar and actual dollar amount. Suppose you borrowed Rs.1,20,000 from a bank to buy a bike and you have promised to pay Rs.6000 per month for two years. What is the inflation free interest rate you are supposed to pay if average inflation rate is 0.75% per month. [4+4]

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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEX, BCT	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Embedded System (CT655)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. What is an embedded system? List out its different types. Why is it so hard to define? Define deadlock and explain the Coffman's condition for deadlock.   [3+1+4]

2. Develop algorithm; draw the state diagram and design the datapath of a custom single purpose processor that determines the largest of four integers. Propose the block diagram of its controller also.   [8]

3. How general purpose processors differ from application specific instruction set processor (ASIPs)? What are the common features of ASIPs for digital signal processors?   [4+4]

4. Construct $2^{(k+1)} X n$ and $2^{(k)} X 4n$ memories using $2^{(k)} X n$ memory modules.   [4+4]

5. What is arbitration? Explain Priority Arbitration and Daisy Chain Arbitration in brief?   [8]

6. Define Kernel and differentiate between monolithic kernel and micro kernel. Consider three processes with process ID's P1, P2, P3 with estimated completion time 10, 5, 7 milliseconds and priorities 1, 3, 2 (0-highest priority, 3-lowest priority) respectively enters the ready queue together. A new process P4 with estimated completion time 6 ms and priority 0 enters the "Ready" queue after 5 ms of start of execution of P1. Calculate the waiting time and Turn Around Time (TAT) for each process and also calculate the Average waiting time and average TAT for priority Based Preemptive Scheduling Algorithm. Assume there is no I/O waiting for the processes.   [3+5]

7. Explain the metrics used to measure control objectives? Write an algorithm to implement the PID controller in software.   [4+4]

8. Explain Full-Custom, Semi –Custom and PLD schemes used in IC technology with steps and comparison.   [8]

9. What are the important operational features of 8051 microcontroller? Write an assembly program to display 0 to 9 in seven segments display.   [3+5]

10. Write an algorithm and Finite State Machine VHDL code for a custom processor that calculates Greatest Common Divisor of two numbers.   [2+6]
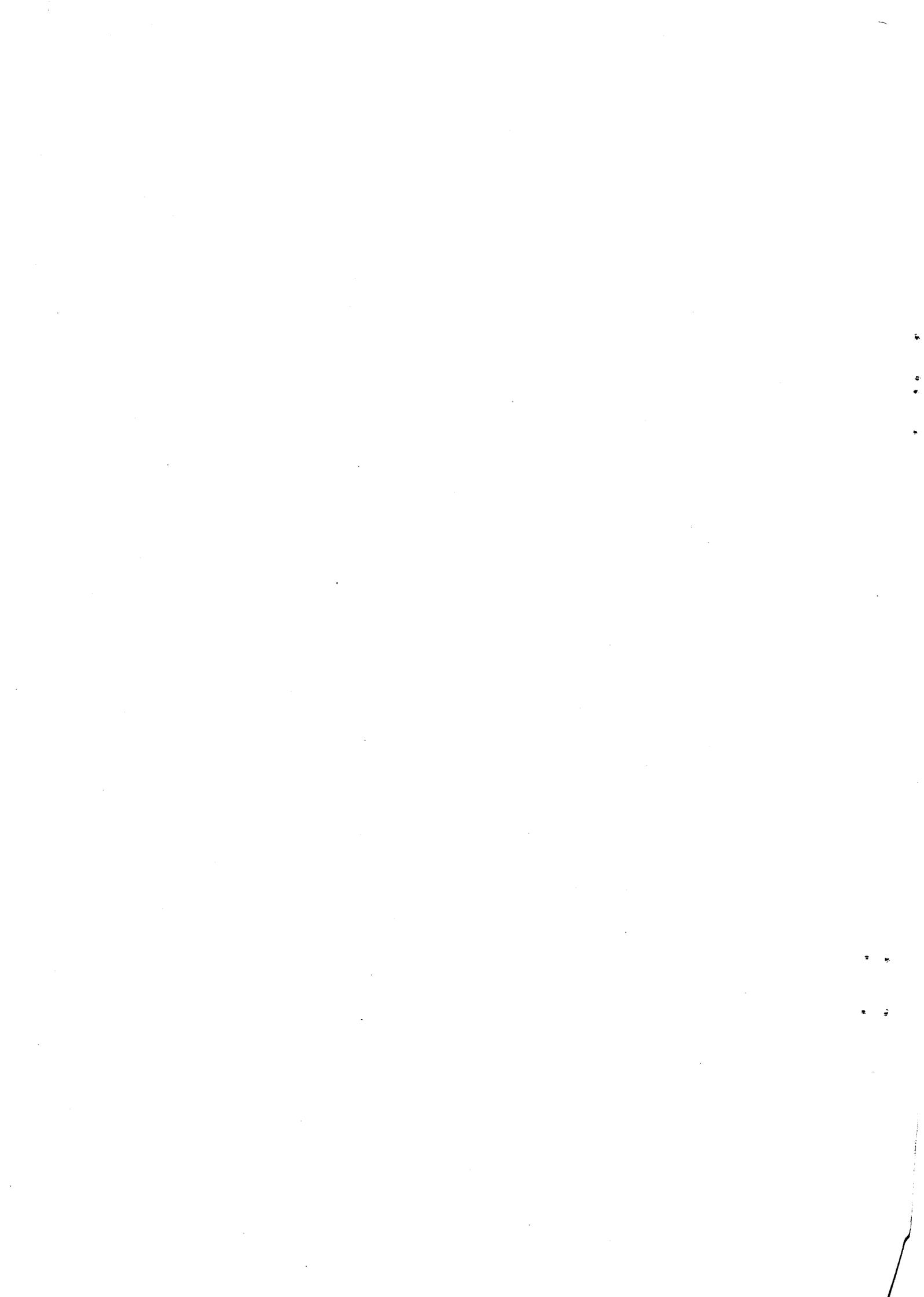
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Subject: - Signal Analysis *(EX651)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ *Attempt __All__ questions.*
✓ *The figures in the margin indicate __Full Marks__.*
✓ *Assume suitable data if necessary.*

1. Differentiate between continuous time and discrete time signals with examples. Show that

$$U[n] = \sum_{k=0}^{\infty} \delta[n-k]$$ [2+4]

2. Calculate the fundamental period and fundamental frequency of the periodic signal

$$x[n] = 3\sin\left(\frac{7\pi}{5}n + \frac{\pi}{2}\right)$$ [4]

3. Derive the expression for finding even and odd part of signal x(t). Explain time scaling and time folding.   [2+3]

4. Define discrete time complex exponential signal and its different types of behavior.   [2+3]

5. a) Derive the expression for Fourier transform equation and inverse Fourier transform equation for continuous time aperiodic signals.   [8]

   b) State and prove Frequency shift property of the continuous time Fourier Transform.   [3]

6. State and prove Parseval's relation for the Discrete time periodic signal.   [5]

7. What are the differences between Fourier series and Fourier Transform? Find the Fourier

   transform of the discrete time signal $x[n] = a^n \begin{cases} |a| < 1 \\ 0 < a < 1 \end{cases}$ [2+6]

8. Derive the expression for convolution integral for continuous time signal.   [6]

9. What is LTI system? In a LTI system show that convolution operation is commutative, find y[n] when $x[n] = \{1,2,3,4\}$ and $n[n] = \{2,1,2\}$ [2+3+5]

10. What is sampling? Determine the Nyquist rate for the following signal: [2+3]

    $$x(t) = 1 + \cos(200\pi t) + \sin(4000\pi t)$$

11. Derive Formula to calculate the impulse response of continuous time ideal low pass filter. Is this system practically realizable or not.   [4+2]

12. Write short notes on: [3×3]

    i) Energy and power signals
    ii) Invertibility of LTI system
    iii) Nyquist theorem

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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Communication System I *(EX652)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt *All* questions.
✓ The figures in the margin indicate *Full Marks*.
✓ Assume suitable data if necessary.

1. How does noise limit the performance of communication system? Describe the types and causes of any four types of internal noise that may affect the communication system.   [2+8]

2. a) What do you understand by Impluse response and transfer functions of a system? Explain its significance.   [4+2]

   b) Define Energy and Power Signal. Explain the meaning of bandwidth of a system along with necessary diagrams.   [2+2]

3. Define power Spectral Density (PSD). Find expression for PSD and its relationship with autocorrelation function.   [2+4+4]

4. Why is conventional AM wasteful of power and bandwidth? Explain the method of conventional AM generation by using switching modulator.   [4+6]

5. An amplitude modulated wave is given by
   $$s(t) = 50(1 + 0.3\cos 3141.60t + 0.2\cos 2513.28t)\cos 10^6 t$$ [4+3+3]
   i)   Draw the amplitude spectrum of s(t)
   ii) Determine the bandwidth of s(t)
   iii) Calculate the power efficiency

6. Draw the block diagram of Costas Loop detector and explain how it demodulates DSB-SC AM and corrects for phase error.   [4+4+2]

7. Find the time domain expression for Narrowband FM signal. How NBFM can be used to generate Wideband FM signal?   [6+4]

8. Write short notes on: (any two)   [2×5]
   i)   Frequency Division Multiplexing (FDM)
   ii) FDMA in Satellite Communication
   iii) Filter and Oscillator requirements in FDM

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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Network (CT657)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. Explain the importance of layered architecture of computer networking. Explain the function of following devices in brief: [4+6]

   i) Hub
   ii) Bridge
   iii) Router

2. A frame having size of 100 bits is transmitted through a channel having capacity of 200 KB/Sec. Calculate the percentage of idleness of the channel assuming the round trip time of the channel to be 20 ms. Is the channel efficient? What is your recommendation further? [5+1+4]

3. Explain HDLC with its frame format. Explain the fault tolerance mechanism of Fiber Distributed Data Interface. [4+4]

4. What are the mechanisms adapted for optimization of uses of IP address. Explain with your example the use of sub-netting showing network address, broadcast address and sub-net mask. [4+6]

5. What is socket? Explain connection management of TCP. [1+7]

6. What is the difference between POP and IMAP? Explain DNS servers and its query types. [3+5]

7. Why the world has decided to migrate to new internet addressing scheme IPV6? Which method do you suggest for the migration of IPv4 to IPv6 and why? [3+5]

8. What are the properties of secure communication? Encrypt and Decrypt "OIE" message using RSA algorithm. [3+7]

9. Write short notes on: (any two) [4×2]

   i) Token Bucket algorithm
   ii) E_1 Telephone Hierarchy
   iii) Distance vector routing

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Exam.		Regular	
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Propagation and Antenna *(EX653)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt __All__ questions.
✓ The figures in the margin indicate __Full Marks__.
✓ Assume suitable data if necessary.

1. Explain briefly radiation mechanism in single wire antenna. [5]

2. What is a linear array? Differentiate between a broadside array and end firearray. [1+4]

3. Explain the constructional features, operating principle and characteristics of rhombic antenna. [8]

4. Explain parabolic reflector antenna with characteristics, radiation pattern and feed system. [7]

5. Briefly discuss the propagation characteristics of space wave and sky wave. [8]

6. A parabolic reflector antenna having the antenna efficiency 85% is designed for 3 GHz resonant frequency with 2.5 dB wavelength loss. Find out the antenna diameter if effective isotropic radiated power (EIRP) is calculated 46 dBW and transmitting power is 500 watt. [8]

7. Write down the factors which affect the surface wave communication. Explain the major characteristics of MW and SW radio propagation. [2+6]

8. Derive the expression for the path loss in case of radio wave propagation. [6]

9. What are the various elements of an optical communication system? Explain each element in brief. [8]

10. Compare optical fiber communication with cable and radio communication systems. Describe numerical aperture (NA) in optical communication system. [4+4]

11. Write short notes on: (Any three) [3×3]

    i)   Helical antenna
    ii) Tropospheric scatter propagation
    iii) Firiis transmission equation
    iv) Printed antenna
    v)   Pyramidal horn antenna

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Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEX	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

Subject: - Computer Network (CT657)

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ Attempt **All** questions.
✓ The figures in the margin indicate **Full Marks**.
✓ Assume suitable data if necessary.

1. How the client-server model works? Differentiate it with peer-to-peer network with advantages and disadvantages. [3+5]

2. List guided and unguided media used in computer network. Explain Ethernet cable standards. [2+6]

3. What is PPP? Explain fault tolerance mechanism of FDDI. [2+6]

4. What is the importance of routing in computer networking? Explain how distance vector routing algorithm operates dynamically? What is its problem? [2+6+2]

5. What is physical address? You are given the IP address block 201.40.58.0/24. Design the subnet for 49, 27, 1145 hosts group so that IP address wastage is minimum. Find subnet mask, network ID, broadcast ID, assigned IP and unassigned IP range in each department. [2+6]

6. Define UDP with its header structure. Explain the leaky Bucket algorithm for traffic shaping. [4+4]

7. What is DNS? How can you transfer mail over internet? What are the protocols used on it? [1+4+3]

8. Explain IPV6 Headers with its features. Compare it with IPV4. [2+6]

9. What is cryptography? How Deffi Hellman algorithm negotiate a shared key between the receiver and transmitter. Explain with example. [2+6]

10. Write short notes on: (any two) [3×2]

   i) Hypertext transfer protocol
   ii) Flow control mechanism
   iii) Web Server

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