CBCS SCHEME

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17MAT41

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Engineering Mathematics – IV

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the Taylor series method, the value of y at x = 0.1 to five decimal places from $\frac{dy}{dx} = x^2y - 1$, y(0) = 1. Consider upto 4th degree terms. **(06 Marks)**

b. Solve $\frac{dy}{dx} = \frac{y-x}{y+x}$ with y(0) = 1 and hence find y(0.1) by taking one step using Runge-Kutta method of fourth order. **(07 Marks)**

c. Given $\frac{dy}{dx} = \frac{x+y}{2}$, given that y(0) = 2, y(0.5) = 2.636, y(1) = 3.595, y(1.5) = 4.968 then find the value of y at x = 2 using Milne's method. **(07 Marks)**

OR

2 a. Using modified Euler's method, solve $\frac{dy}{dx} = x + |\sqrt{y}|$ with y(0) = 1 and hence find y(0.2) with h = 0.2. Modify the solution twice. **(06 Marks)**

b. Use fourth order Runge-Kutta method to find y(0.2), given $\frac{dy}{dx} = 3x + y$, y(0) = 1. **(07 Marks)**

c. Find y at x = 0.4 given $\frac{dy}{dx} + y + xy^2 = 0$ at $y_0 = 1$, $y_1 = 0.9008$, $y_2 = 0.8066$, $y_3 = 0.722$ taking h = 0.1 using Adams-Bashforth method. **(07 Marks)**

Module-2

3 a. Given $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$. Find y at x = 0.2. Correct to four decimal places, given y = 1 and y′ = 0 when x = 0 using Runge-Kutta method. **(06 Marks)**

b. If α and β are two distinct roots of $J_n(x) = 0$ then prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x) = 0$ if $\alpha \neq \beta$. **(07 Marks)**

c. Show that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\cos x$. **(07 Marks)**

OR

4 a. Given $\frac{d^2y}{dx^2} = 1 + \frac{dy}{dx}$, y(0) = 1, y′(0) = 1, compute y(0.4) for the following data, using Milne's predictor-corrector method.
y(0.1) = 1.1103, y(0.2) = 1.2427, y(0.3) = 1.399
y′(0.1) = 1.2103, y′(0.2) = 1.4427, y′(0.3) = 1.699 **(06 Marks)**

b. Express $x^3 + 2x^2 - x - 3$ in terms of Legendre polynomial. **(07 Marks)**

c. Derive Rodrigue's formula $P_n(x) = \frac{1}{2^n n!}\frac{d^n}{dx^n}[(x^2-1)^n]$ **(07 Marks)**

Module-3

5 a. State and prove Cauchy-Rieman equation in Cartesian form. **(06 Marks)**

b. Evaluate $\int_C \frac{e^{2z}}{(z+2)(z+4)(z+7)}.dz$ where C is the circle $|z| = 3$ using Cauchy's residue theorem. **(07 Marks)**

c. Discuss the transformation $W = e^z$. **(07 Marks)**

OR

6 a. Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ **(06 Marks)**

b. State and prove Cauchy's integral formula. **(07 Marks)**

c. Find bilinear transformation which maps Z = i, 1, –1 onto W = 1, 0, ∞ **(07 Marks)**

Module-4

7 a. A random variable X has the following probability function for various values of x:

X (= xi)	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

Find: (i) The value of K (ii) P(x < 6) (iii) P(x ≥ 6) **(06 Marks)**

b. Derive mean and variance of the binomial distribution. **(07 Marks)**

c. The joint probability distribution of two random variables X and Y as follows:

X \ Y	–4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

Determine: (i) Marginal distribution of X and Y (ii) Covariance of X and Y
(iii) Correlation of X and Y **(07 Marks)**

OR

8 a. In a certain factory turing out razor blades, there is a small chance of 0.002 for a blade to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing: (i) no defective (ii) one defective (iii) two defective blades, in a consignment of 10,000 packets. **(06 Marks)**

b. In an examination 7% of students score less than 35% marks and 89% of students score less than 60% marks. Find the mean and standard deviation if the marks are normally distributed. Given $p(0 < z < 1.2263) = 0.39$ and $p(0 < z < 1.4757) = 0.43$. **(07 Marks)**

c. Given:

X \ Y	0	1	2	3
0	0	1/8	1/4	1/8
1	1/8	1/4	1/8	0

Find : (i) Marginal distribution of X and Y (ii) E[X], E[Y], E[XY] **(07 Marks)**

Module-5

9 a. Define the terms:

(i) Null hypothesis

(ii) Confidence interval

(iii) Type-I and Type-II errors **(06 Marks)**

b. A certain stimulus administered to each of the 12 patients resulted in the following change in the blood pressure 5, 3, 8, −1, 3, 0, 6, −2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure ($t_{0.05}$ for 11 d.f is 2.201) **(07 Marks)**

c. Given the matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$. Find the fixed probability vector. **(07 Marks)**

OR

10 a. A die thrown 9000 times and a thrown of 3 or 4 was observed 3240 times. Is it reasonable to think that the die is an unbiased one? **(06 Marks)**

b. Four coins are tossed 100 times and the following results were obtained:

Number of Heads	0	1	2	3	4
Frequency	5	29	36	25	5

Fit a binomial distribution for the data and test the goodness of fit [$\chi^2_{0.05} = 9.49$ for 4 d.f]. **(07 Marks)**

c. Every year, a man trades for his car for a new car. If he has Maruti, he trade it for a Tata. If he has a Tata, he trade it for a Honda. However, if he has a Honda, he is just as likely to trade it for a new Honda as to trade it for a Maruti or a Tata. In 2016, he bought his first car which was a Honda. Find the probability that he has (i) 2018 Tata (ii) 2018 Honda (iii) 2018 Maruti. **(07 Marks)**

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17MATDIP41

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the rank of the matrix by elementary row transformation:

$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$ (06 Marks)

b. Solve the following system of linear equations by Gauss elimination method:
$x + y + z = 9; \quad x - 2y + 3z = 8; \quad 2x + y - z = 3$ (07 Marks)

c. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$. (07 Marks)

OR

2 a. Find the rank of the matrix by elementary row transformation

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$$ (06 Marks)

b. Use Cayley-Hamilton theorem to find the inverse of $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. (07 Marks)

c. Test for consistency and solve $x + y + z = 6, \quad x - y + 2z = 5, \quad 3x + y + z = 8$. (07 Marks)

Module-2

3 a. Solve $(D^3 - 2D^2 + 4D - 8)y = 0$ where $D = \frac{d}{dx}$. (06 Marks)

b. Solve $(6D^2 + 17D + 12)y = e^{-x}$, where $D = \frac{d}{dx}$ (07 Marks)

c. Solve $(D^2 + a^2)y = \sec ax$ by the method of variation of parameters. (07 Marks)

OR

4 a. Solve $(D^3 - 3D + 2)y = 0$ where $D = \frac{d}{dx}$. (06 Marks)

b. Solve $(D^2 - 4D + 13)y = \cos 2x$ where $D = \frac{d}{dx}$. (07 Marks)

c. Solve $(D^2 + 2D + 1)y = 2x + x^2$ where $D = \frac{d}{dx}$. (07 Marks)

Module-3

5 a. Find the Laplace transform of the function $L\{e^{-2t}(2\cos 5t - \sin 5t)\}$. (06 Marks)

b. Find the Laplace transform of the function $L\{t \cdot \cos at\}$. (07 Marks)

c. If $f(t) = t^2$, $0 < t < 2$, and $f(t + 2) = f(t)$, for $t > 2$, find $L\{f(t)\}$ (07 Marks)

OR

6 a. Find the Laplace transform of the function $L\{e^{3t}\sin 5t \sin 3t\}$. (06 Marks)

b. Find the Laplace transform of $\frac{e^{-at} - e^{-bt}}{t}$. (07 Marks)

c. Find the Laplace transform of the function $L\{3t^2 + 4t + 5\}.u(t-3)$. (07 Marks)

Module-4

7 a. Find the inverse Laplace transform of the function $\left\{\frac{1}{s+2} + \frac{3}{2s+5} - \frac{4}{3s-2}\right\}$. (06 Marks)

b. Find the inverse Laplace transform of the function $\frac{3s+2}{(s-2)(s+1)}$. (07 Marks)

c. Solve by using Laplace transforms $\frac{d^2y}{dt^2} + K^2y = 0$ given that $y(0) = 2$, $y'(0) = 0$. (07 Marks)

OR

8 a. Find the inverse Laplace transform of the function $\left\{\frac{s+2}{s^2+36} + \frac{4s-1}{s^2+25}\right\}$. (06 Marks)

b. Find the inverse Laplace transform of the function $\frac{s+2}{s^2(s+3)}$. (07 Marks)

c. Solve $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, $y(0) = 0$, $y'(0) = 0$ by using Laplace transform method. (07 Marks)

Module-5

9 a. A bag contains 7 white, 6 red and 5 black balls, two balls are drawn at random. Find the probability that they will both be white. (06 Marks)

b. If A and B are any two events, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. (07 Marks)

c. State and prove Bayee's theorem. (07 Marks)

OR

10 a. A has 2 shares in a lottery in which there are 3 prizes and 5 blanks; B has 3 shares in a lottery in which there are 4 prizes and 6 blanks. Show that A's chance of success is to B's as 27:35. (06 Marks)

b. A card is drawn from a well-shuffled pack of playing cards. What is the probability that it is either a spade or an ace? (07 Marks)

c. A bag X contains 2 white and 3 red balls and a bag Y contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to the red. Find the probability that it was drawn from bag Y. (07 Marks)

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17CS43

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain orders of growth for large input size and write values of following functions for analysis of algorithms:
$\log_2 n$, n, n^2, n^3, 2^n, n! (10 Marks)

b. Explain asymptotic notations of algorithms with graph. (06 Marks)

c. Define space complexity of algorithms with example. (04 Marks)

OR

2 a. Write general plan for analyzing time efficiency of non-recursive algorithms and find the running time of matrix multiplication algorithm. (10 Marks)

b. Write short note on stacks, queues, graphs trees and sets. (10 Marks)

Module-2

3 a. Define divide and conquer technique and write steps to search the number 14 in the following sequence using binary search algorithm:
74, 32, 18, 12, 76, 14, 23, 28, 10 (10 Marks)

b. Sort the following numbers using Quick sort algorithm:
54, 26, 93, 17, 77, 31, 44, 55, 20 (10 Marks)

OR

4 a. Solve the following matrix multiplication using Strassen's matrix multiplication method:

$$A = \begin{bmatrix} 3 & 2 \\ 5 & 6 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 6 \\ 1 & 3 \end{bmatrix} \quad C = A \times B$$ (10 Marks)

b. Solve the following topological sorting problem using source removal algorithm. (05 Marks)

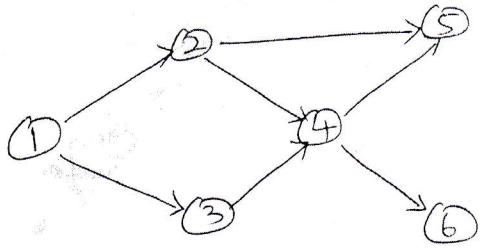

Fig.Q.4(b)

c. Write the MaxMin divide and conquer algorithm. (05 Marks)

Module-3

5 a. Solve the following Job sequencing with deadline problem and find the maximum profit:

Jobs	J1	J2	J3	J4	J5	J6	J7	J8	J9
Profit	85	25	16	40	55	19	92	80	15
Deadline	5	4	3	3	4	5	2	3	7

(10 Marks)

b. Construct a Huffman Tree for the following data and obtain its Huffman code:

Character	a	b	c	d	e	f
Frequency	5	9	12	13	16	45

(10 Marks)

OR

6 a. Define minimum cost spanning tree and find the minimum cost spanning tree for the following group using Kruskal's algorithms. **(10 Marks)**

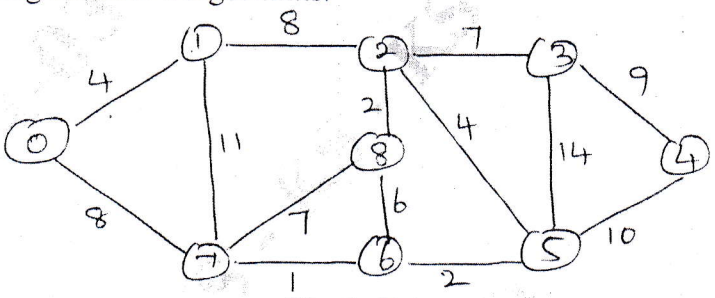

Fig.Q.6(a)

b. Sort the following sequence using Heapsort algorithm:
15, 19, 10, 7, 17, 16

(10 Marks)

Module-4

7 a. Find a minimum cost path from s to t in the multistage graph of Fig.Q.7(a), using Dynamic Programming Forward approach. **(10 Marks)**

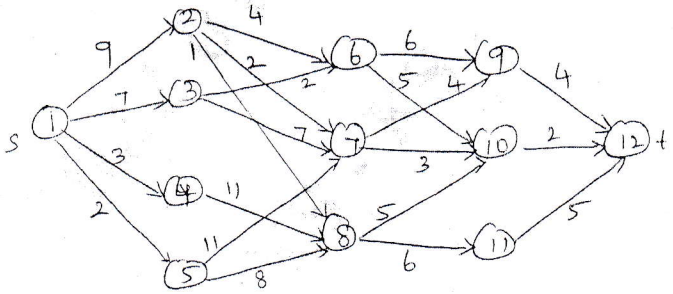

Fig.Q.7(a)

b. Solve the following Knapsack problem using Dynamic programming:
Knapsack capacity W = 5

Item	Weight	Value
1	2	12
2	1	10
3	3	20
4	2	15

(10 Marks)

OR

8 a. Find all pairs shortest path for the following graph using Floyd's algorithm:

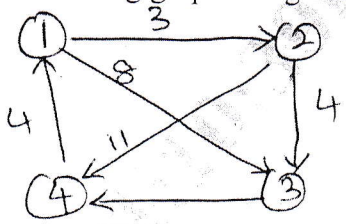

Fig.Q.8(a)

(10 Marks)

b. Find the single source shortest path in the following graph using Bellman Ford algorithm.

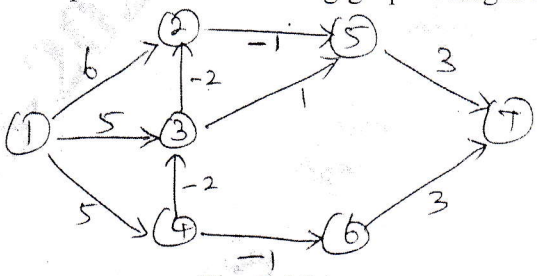

Fig.Q.8(b)

(10 Marks)

Module-5

9 a. Let W = {5, 7, 10, 12, 15, 18, 20} and M = 35 find all the possible subsets of W that sum to M. Apply sum of subset algorithm. (08 Marks)

b. Define Backtracking technique. (02 Marks)

c. Explain NP-Hard and NP-complete problems. (10 Marks)

OR

10 a. Solve the following assignment problem using Branch and Bound technique:

	Job1	Job2	Job3	Job4
Person A	9	2	7	8
Person B	6	4	3	7
Person C	5	8	1	8
Person D	7	6	9	4

(10 Marks)

b. Draw the state-space tree of solving the four queen using Backtracking. (05 Marks)

c. Write short note on LC Branch and Bound solutions. (05 Marks)

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17CS44

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Microprocessors and Microcontrollers

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Draw and explain internal block diagram of 8086 CPU in detail with all register set. (10 Marks)

b. Show the memory dump for the following data section or data segment:

```
.DATA
ORG 0010H
DATA1 DB 25
DATA2 DB 10001001B
DATA3 DB 12H
ORG 0020H
DATA4 DB '2591'
ORG
DATA5 DW 9, 2, 7, 0CH, 00100000B, 5
DATA6 DW 4DUP (00H)
```

(05 Marks)

c. Explain with an example. Why and how a 20 bit address is generated in 8086. (05 Marks)

OR

2 a. Explain the different addressing modes used in 8086 microprocessor with suitable example. (10 Marks)

b. If CS = 24F6H and Ip = 634AH, find logical address, offset address, physical address, lower range and upper range of code segment. (05 Marks)

c. Write a program that transfers a 6 bytes of data from memory location with offset of 0010H to memory locations with offset of 0028H. (05 Marks)

Module-2

3 a. Write a program to calculate total sum of 5 bytes of data. Each byte represents daily wages of a worker; the decimal data is as follows 125, 235, 197, 91 and 48. (06 Marks)

b. Explain with example, how BCD number 29H is converted to ASCII numbers 32H 39H. (06 Marks)

c. Explain the four cases of the Division with an example. (08 Marks)

OR

4 a. Write a program to i) Clear screen ii) Set the video mode to CGA of 640 × 200 resolution and iii) Draw Horizontal line starting at column = 100, ROW = 50 and ending at column = 200, ROW = 50. (09 Marks)

b. Give five differences between INT and CALL instruction. (05 Marks)

c. Find the physical and logical address in the interrupt vector table for INT 12H and INT 8. (06 Marks)

Module-3

5 a. Explain the following instructions with an example:
i) CBW ii) CWD iii) IDIV iv) IMUL. (08 Marks)

b. Write a program that scans the string "Mr. Gones" and replaces the "G" with letter "J" then displays correct name. (06 Marks)

c. With an example, explain STOS, LODS and MOVS instructions. (06 Marks)

OR

6 a. Assume that we have 4 bytes of hexadecimal data: 25H, 62H, 3FH, 52H.
i) Find checksum byte.
ii) Perform checksum operation to ensure data integrity.
iii) If the second byte 62H had been changed to 22H, show how checksum detects the error. (04 Marks)

b. Explain briefly the control word format of 8255 in I/O mode. Find the control word if PA = out, PB = in, $PC_0 - PC_3$ = in and $PC_4 - PC_7$ = out. Use port addresses of 300H – 303H for the 8255 chip. Then get data from port B and send it to port A. (08 Marks)

c. Write a program to toggle all bits of Port A continuously with some delay, use INT 16H to exit if there is a key press. (08 Marks)

Module-4

7 a. Give differences between CISC and RISC. (05 Marks)

b. Explain about ARM processor modes and complete registers set with neat diagram. (10 Marks)

c. With an example explain how processor changes the mode from user mode to interrupt request mode. (05 Marks)

OR

8 a. Explain ARM7 three-stage pipeline with an example. (07 Marks)

b. Explain Von-Neumann style core and Harvard style core. (08 Marks)

c. Explain different types of memory management hardware. (05 Marks)

Module-5

9 a. With an example, explain the following instructions with an example:
i) MOVN ii) LDRB iii) MUL iv) UMULL. (10 Marks)

b. Explain the following, with an example:
i) Multiple-Register transfer instructions
ii) MSR and MRS instructions. (10 Marks)

OR

10 a. How stack operations can be carried out using load-store multiple instructions. (06 Marks)

b. Explain pre-index with write back and post index with an example. (08 Marks)

c. Explain barrel shifter with suitable example. (06 Marks)

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17CS46

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Data Communication

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is Data Communication? Explain the fundamental characteristics of Data Communication. **(06 Marks)**

b. What are the principles of protocol layering? Explain the layers in the TCP/IP protocol suite, with a neat diagram. **(08 Marks)**

c. Compare the four basic topology with a neat diagram. **(06 Marks)**

OR

2 a. Describe the various transmission impairments of data communication. **(09 Marks)**

b. Compare and contrast the simplex, half duplex and full duplex, dataflow in data communication. **(06 Marks)**

c. Assume that $SNR_{dB} = 36$, channel band width is 2MHz calculate signal to noise ratio (SNR) and channel capacity. **(05 Marks)**

Module-2

3 a. Define line coding. Draw the line coding for a sequence 10110001 using i) NRZ-L ii) NRZ-I iii) RZ iv) Manchester coding. **(10 Marks)**

b. Discuss pulse code modulation mechanism and explain quantization and encoding of sampled signals. **(10 Marks)**

OR

4 a. List out the different transmission modes and briefly explain with an examples. **(07 Marks)**

b. An analogy signal has a bit rate of 8000 bps and band rate of 1000 bands, how many data elements are carried by each signal element and how many signal elements does it need. **(05 Marks)**

c. Describe Frequency Shift Keying (FSK) and Amplitude Shift Keying (ASK) with neat diagram. **(08 Marks)**

Module-3

5 a. Define multiplexing. Explain frequency division multiplexing with an example. **(07 Marks)**

b. Explain Frequency Hopping Spread Spectrum (FHSS) and Direct sequence spread spectrum with a neat sketch. **(07 Marks)**

c. Explain the mechanism of CRC encoder and decoder. **(06 Marks)**

OR

6 a. What is circuit switching? List out characteristics of it and analyze the three phase of it. **(10 Marks)**

b. What is checksum? Write an algorithm to calculate traditional checksum? How to justify the corrupted data received or uncorrupted data received from the checksum (7, 11, 12, 0, 9) for these five data numbers are sent from source to destination. **(10 Marks)**

Module-4

7 a. Explain frame formats of HDLC protocol. **(05 Marks)**

b. Explain stop and wait protocol with data flow diagram. **(05 Marks)**

c. What is Random access? Explain procedure of pure ALOHA protocol, find out throughput for pure ALOHA network which transmits 200 bits frames on shared channel of 200kbps for

i) 1000 frames per second

ii) 500 frames per second

iii) 250 frames per second. **(10 Marks)**

OR

8 a. Explain polling with a neat diagram. **(06 Marks)**

b. Describe transition phases of PPP protocol. **(06 Marks)**

c. Describe classful addressing with an example. **(08 Marks)**

Module-5

9 a. Explain GIGABIT Ethernet design techniques. **(10 Marks)**

b. Explain Architecture of Bluetooth and describe logical link control of it. **(10 Marks)**

OR

10 a. What is cellular telephony? Explain its operations. **(10 Marks)**

b. Discuss second generation of cellular telephony. **(10 Marks)**

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