

- N.B. :** (1) All questions are compulsory.  
 (2) Each question carries 10 marks.  
 (3) Internal choices are there in each question.  
 (4) Figures to the Right indicate full marks.

- |    |  |    |
|----|--|----|
| 1. | Attempt any Two :  | 10 |
|    | (a) Express $\cos 4\alpha$ and $\sin 4\alpha$ in terms of power of $\sin \alpha$ and $\cos \alpha$ . | 5  |
|    | (b) Solve : $x^4 + 1 = 0$  | 5  |
|    | (c) Find the image of $x^2 + y^2 = 1$ under the map $W = e^z$ .                                      | 5  |
| 2. | Attempt any Two :  | 10 |
|    | (a) Find the Laplace Transform of $t\sin^2 t$ .  | 5  |
|    | (b) Evaluate $\int_0^{\infty} \frac{e^{-2t} - e^{-t}}{t} dt$ by using Laplace Transform.             | 5  |
|    | (c) Find the Laplace Transform of $\sin 2t + t\cos 3t$ .   | 5  |
| 3. | Attempt any Two :  | 10 |
|    | (a) Find $L^{-1}\left[\log\left(\frac{S+a}{S+b}\right)\right]$                                       | 5  |
|    | (b) Find inverse Laplace Transform of $\frac{S+1}{(S+2)(S+3)}$                                       | 5  |
|    | (c) Find $L^{-1}\left[\tan^{-1}\left(\frac{2}{S}\right)\right]$                                      | 5  |
| 4. | Attempt any Two :  | 10 |
|    | (a) Find inverse Laplace Transform of $\frac{S+1}{S(S^2+2)}$   | 5  |
|    | (b) Evaluate $\int_C \frac{dz}{(z+1)(z+3)}$ where 'C' is $ z  = 1.5$                                 | 5  |
|    | (c) Find the Residues of $f(z) = \frac{1}{(z+3)(z-1)^2}$ at their Poles.                             | 5  |

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5. Attempt any Two : 10

(a) Evaluate  $\int_0^{\infty} 7^{-2x^2} dx$  5

(b) Evaluate  $\int_0^{\infty} \frac{dt}{1+t^2}$  5

(c) Prove that  $\int_0^1 \frac{x^a - 1}{\log x} dx = \log(1+a)$  where  $a \geq 0$  5

6. Attempt any Two : 10

(a) Obtain Fourier Cosine transform of  $f(t) = e^{-t} + e^{4t}$  5

(b) Obtain Fourier series of  $f(x) = |x|$  in  $(-1, 1)$  5

(c) Obtain Half Range Sine Series of  $x^2$  in  $(0, \pi)$  5

7. Attempt any Two : 10

(a) Evaluate  $\int_0^1 \int_0^3 (xy^3) dy dx$  5

(b) Find the Area Bounded by  $y^2 = x$  and  $y = x^2$  5

(c) Evaluate  $\int_{-1}^1 \int_{-2}^2 \int_0^4 x^3 y z^2 dz dx dy$  5

8. Attempt any Two : 10

(a) Find the Volume Bounded by  $Z = x^2 + y^2$  and the plane  $Z = 4$ . 5

(b) Find the Volume Bounded by  $x^2 + y^2 + z^2 = 9$  and  $x = 0, y = 0$  and  $z = 0$  by using Spherical Coordinates. 5

(c) Evaluate  $\int_0^1 \int_0^x dy dx$  by using Polar Coordinates. 5

(3 Hours)

[Total Marks : 100

- N.B. :** (1) All questions are compulsory.  
 (2) Figures to the Right indicate full marks.

1. Attempt any One:

- (a) Find the complex number  $z$  if  $\arg(z+1) = \frac{\pi}{6}$  and  $\arg(z-1) = \frac{2\pi}{3}$  10  
 (b) Obtain Fourier Series of  $x \sin x$  in  $(-\pi, \pi)$  10

2. Attempt any Three :

- (a) Express  $\cos 3\alpha$  and  $\sin 3\alpha$  in terms of power of  $\sin \alpha$  and  $\cos \alpha$   
 (b) Solve :  $x^5 = 1 = 0$   
 (c) Derive the formula for  $\tanh^{-1}(x)$   
 (d) Find the complex logarithm of  $(p)1 + i$   $(q)-3i$  15

3. Attempt any Three :

- (a) Find the bilinear Transformation which maps  $0, i$  &  $\infty$  to  $1, 0$  &  $-1$   
 (b) Show that  $f(Z) \equiv \bar{z}$  is not Analytic on  $\mathbb{C}$  15

(c) Evaluate  $\int_C \frac{dz}{(z+7)(z-2)}$  where 'C' is  $|z|=2$

(d) Find the Residues of  $f(z) = \frac{z}{(z+3)(z-1)^2}$  at their Poles

4. Attempt any Three :

(a) Evaluate  $\int_0^{\infty} e^{-2t} \cos^2 t \, dt$  by using Laplace Transform 15

(b) Find the Laplace Transform of  $t^2 e^{2t}$

(c) Find inverse Laplace Transform of  $\frac{S+2}{(S+1)(S^2+9)}$

(d) Find  $L^{-1}\left[\cot^{-1}\left(\frac{1}{S}\right)\right]$

[TURN OVER

5. Attempt any Three :

15

(a) Evaluate  $\int_0^{\pi} \sin^3 \theta \cos^4 \theta d\theta$

(b) Evaluate  $\int_0^1 x \left[ \log\left(\frac{1}{x}\right) \right]^4 dx$

(c) Prove that  $\int_0^1 \frac{x^p - 1}{\log x} dx = \log(1+p)$  where  $p \geq 0$

(d) Evaluate  $\int_0^{\infty} 7^{-x^2} dx$

6. Attempt any Three :

15

- (a) Obtain Fourier Transform of  $f(x) = e^{-|x|}$ .  
 (b) Obtain Fourier series of  $f(x) = x|x|$  in  $(-\pi, \pi)$ .  
 (c) Obtain Half Range Sine Series of  $x^2$  in  $(0, \pi)$ .  
 (d) Obtain Fourier Cosine transform of  $f(t) = e^{-2t} + e^t$ .

7. Attempt any Three :

15

(a) Evaluate  $\int_0^4 \int_0^x (x+y) dy dx$

(b) Evaluate  $\int_{-10}^1 \int_0^2 \int_0^3 xyz^3 dz dx dy$

(c) Find the Area in first quadrant Bounded by  $y = x$  and  $y = x^2$

(d) Find the Volume Bounded by  $Z = x^2 + y^2$  and plane  $Z = 25$

- N.B. :** (1) All Questions from question nos. 1 to 7 are compulsory.  
(2) Figures to the right indicate marks.

1. Attempt **both** the questions:- 10
  - (a) Write notes on URL and FTP.
  - (b) Explain following tags : <marquee>, <sup>, <pre>, <hr>, <iframe>
  
2. Attempt any **three** questions : (5 marks each) 15
  - (a) What are the difference between WWW and internet?
  - (b) Write a short note on E-business.
  - (c) What is DNS? Explain Security with respect to DNS.
  - (d) What is internet? Explain in brief any three applications?
  
3. Attempt any **three** questions: (5 marks each) 15
  - (a) What are the different types of style sheet? Explain with example.
  - (b) What is a list in HTML? Explain its type using an example.
  - (c) Write the syntax for TextArea, Checkbox, Radio button, Select tag, Submit button.
  - (d) What are imagemaps and explain its type.
  
4. Attempt any **three** questions: (5 marks each) 15
  - (a) Explain any 5 operators in JavaScript with small examples?
  - (b) Write a JavaScript code To print the factorial of a given no.
  - (c) Write a short note on Math object.
  - (d) Write short notes on Event handlers giving five examples.
  
5. Attempt any **three** questions: (5 marks each) 15
  - (a) How do you create own tags using XML?
  - (b) What is XML? Give the difference between HTML and XML?
  - (c) What is XSL? Explain in brief.
  - (d) Compare internal and external DTD.
  
6. Attempt any **three** questions: (5 marks each) 15
  - (a) Explain any five PHP Array functions.
  - (b) What is PHP? Give the features of PHP.
  - (c) What is MySQL? Give its salient features.
  - (d) What are the naming rules of variables in PHP?
  
7. Attempt any **three** questions:- (5 marks each) 15
  - (a) Discuss type casting and type conversion in PHP.
  - (b) Explain how cookies are handled using PHP?
  - (c) Explain the string operators in PHP with examples.
  - (d) Explain what are PHP sessions? What is their importance?

(3 Hours)

[Total Marks : 80]

**N.B. :** (1) All Questions from question nos. 1 to 8 are **compulsory**.

(2) **Figures** to the **right** indicate marks.

1. Attempt any **two** questions: (5 marks each) 10
  - (a) What are the difference between WWW and internet?
  - (b) Write a short note on E-business.
  - (c) What is DNS? Explain Security with respect to DNS.
  
2. Attempt any **two** questions: (5 marks each) 10
  - (a) What are the different types of style sheet? Explain with example.
  - (b) What is a list in HTML? Explain its type using an example.
  - (c) Write the syntax for TextArea, Checkbox, Radio button, Select tag, Submit button.
  
3. Attempt any **two** questions: (5 marks each) 10
  - (a) Explain any 5 operators in JavaScript with small examples?
  - (b) Write a JavaScript code to print the factorial of a given no.
  - (c) Write a short note on Math object.
  
4. Attempt any **two** questions: (5 marks each) 10
  - (a) What is internet? Explain in brief any three applications?
  - (b) What are imagemaps and explain its type.
  - (c) Write short notes on Event handlers giving five examples.
  
5. Attempt any **two** questions: (5 marks each) 10
  - (a) How do you create own tags using XML?
  - (b) What is XML? Give the difference between HTML and XML?
  - (c) What is XSL? Explain in brief.
  
6. Attempt any **two** questions: (5 marks each) 10
  - (a) Explain any five PHP Array functions.
  - (b) What is PHP? Give the features of PHP.
  - (c) What is MySQL? Give its salient features.
  
7. Attempt any **two** questions: (5 marks each) 10
  - (a) Discuss type casting and type conversion in PHP.
  - (b) Explain how cookies are handled using PHP?
  - (c) Explain the string operators in PHP with examples.
  
8. Attempt any **two** questions: (5 marks each) 10
  - (a) Compare internal and external DTD.
  - (b) What are the naming rules of variables in PHP?
  - (c) Explain what are PHP sessions? What is their importance?

**N.B. : All questions are compulsory.**

1. Attempt the following questions :—
  - (a) Explain the Organization of microprocessor based system. 5
  - (b) Explain one byte, two byte, three byte instruction with one example each. 5
2. Answer the following (Any Three)
  - (a) Write a short note on Encoder. 5
  - (b) Explain Architecture of Intel 8085 with diagram. 5
  - (c) What is Decoder ? Explain the operation of 3:8 Decoder. 5
  - (d) Write a difference between static RAM and Dynamic RAM. 5
3. Answer the following (Any Three)
  - (a) Draw and Explain the system bus of 8085 microprocessor. 5
  - (b) What is interfacing ? List its purpose ? Describe different types of interfacing. 5
  - (c) What is partial address decoding ? Describe with suitable example. 5
  - (d) State the function of any 5 pins of microprocessor 8085. 5
4. Answer the following (Any Three)
  - (a) Explain the instruction classification for 8085 microprocessor. 5
  - (b) Draw and Explain Programming model of 8085. 5
  - (c) Explain the following instructions :— 5
    - (i) ADD M (ii) SBB R (iii) DCR M (iv) XRI DATA 8 (v) PUSH PSW
  - (d) Write a short note on hardware interrupts of microprocessor 8085. 5
5. Answer the following (Any Three)
  - (a) Explain the structure of modern day computer system. 5
  - (b) What is Cache Memory ? Explain the need of Cache coherency. 5
  - (c) Explain RAID2 with its advantages and disadvantages. 5
  - (d) Define PCI bus with its features. 5
6. Answer the following (Any Three)
  - (a) Explain SFRs of microcontroller 8051. 5
  - (b) Explain the addressing modes of 8051 microcontroller. 5
  - (c) Explain the following term :- BIT, DATA, ASM, IDATA. 5
  - (d) Explain program memory and data memory of 8051 microcontroller. 5
7. Answer the following (Any Three)
  - (a) Explain port 2 in 8085 microcontroller. 5
  - (b) List and explain various timer mode operations. 5
  - (c) Explain serial communication in 8051. 5
  - (d) Explain the following Registers of 8051 :- 5
    - (i) PSW (ii) RO-R7 (iii) B register.

[TURN OVER

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Each questions carries 05 marks.  
 (2) Attempt any two questions.

1. Answer the following (Any Two)
  - (a) Explain EEPROM and EPROM. 5
  - (b) What is Latch ? Describe with its function. 5
  - (c) Explain tri state devices & buffer. 5
2. Answer the following (Any Two)
  - (a) What is flag ? List and describe the flags of 8085 microprocessor. 5
  - (b) Draw the pin diagram of 8085 microprocessor and explain in short. 5
  - (c) Write a difference between memory Mapped i/o and I/O Mapped I/O. 5
3. Answer the following (Any Two)
  - (a) What is Addressing Modes ? Explain with its different types. 5
  - (b) Explain the different group in which instructions of 8085 are classified ? 5
  - (c) Write a 8085 program to load data in the accumulator and find one's and two's complement of the data in accumulator. 5
4. Answer the following (Any Two)
  - (a) Explain 8:3 Encoder with proper diagram. 5
  - (b) What is microprocessor ? List the applications of microprocessor. 5
  - (c) Describe RIM and SIM instruction of 8085. 5
5. Answer the following (Any Two)
  - (a) Define PCI and explain the need of PCI. 5
  - (b) Explain different functions of computer system. 5
  - (c) What is RAID ? State application of RAID. 5
6. Answer the following (Any Two)
  - (a) Explain the programming model of 8051. 5
  - (b) Explain Architecture of Intel 8051 microcontroller with diagram. 5
  - (c) Explain the following instructions :— 5
    - (i) MOV@Ri, A (ii) POP direct (iii) XCH A, Rn (iv) RLC A (v) CPL C
7. Answer the following (Any Two)
  - (a) Define the function of Assembler, Compiler, Linker, Loader and assembler directive. 5
  - (b) Write a short note on Input-Output Ports of microcontroller. 5
  - (c) Explain bit and byte jump instructions. 5
8. Answer the following (Any Two)
  - (a) Write a short note on Cache Memory. 5
  - (b) Write a difference between microprocessor and microcontroller. 5
  - (c) Explain port 1 in 8085 microcontroller. 5



- N.B. :** (1) All Questions are compulsory.  
(2) Draw neat and labelled diagram wherever necessary.  
(3) Figures to the right indicate full marks.

1. Write queries for the below:

10

- (a) Design a database and name it 'University'.  
(b) Design the following tables:  
(i) Student\_Master (columns: RollNo, FName, MName, LName, DOB, Gender, City, District).  
(ii) Course\_Master (columns: CourseID, CourseName, Stream).  
(iii) Admission\_Details (columns: RollNo, CourseID, AdmissionDate).  
(iv) Subject\_Master (columns: SubjectID, SubjectName, CourseID, IsTheory, IsPractical, TotalMarks).  
(v) Exam\_Details (columns: ExamID, ExamDate, RollNo, SubjectID, MarksObtained, Grade, IsPassed)  
(c) Insert 5 or more records in all of the above tables.  
(d) Find all the female students who lives in Mumbai district.  
(e) Find all the students from 'Science' stream who have taken admission in last year.  
(f) Find all the students from 'Arts' stream who have obtained 'A' grade from the exam held during Jan-2019.

2. Answer any three out of four :

15

- (a) Explain Relational Database system and its advantages.  
(b) Write a short note on data abstraction.  
(c) Explain 3<sup>rd</sup> normal form and Boyce-Codd normal form in Normalization with example.  
(d) Write a short note on ACID properties.

3. Answer any three out of four :

15

- (a) Explain merits and demerits of network model in DBMS.  
(b) Explain the limitations of File processing systems and steps to overcome by using Database system.  
(c) Explain the difference between Delete and Truncate command. Also explain cascade deletion with an example.  
(d) Write a short note on business rules on data model.

4. Answer any three out of four :

15

- (a) What is UML? Explain different types of UML diagrams.  
(b) Explain Inner Join, Left Join, Right Join and Self Join in detail with an example.  
(c) List and explain the different types of relational database keys.  
(d) Write a short note on weak entity and strong entity.

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5. Answer any **three** out of **four** : 15
- (a) Explain ER model with example.
  - (b) Explain the projection with example.
  - (c) What is Trigger? Explain the difference between Before and After trigger.
  - (d) Explain the tuple relational calculus.
6. Answer any **three** out of **four**: 15
- (a) Referring the tables in Q#1, write a query to find Gender wise grades for the admissions taken during Jan-2017.
  - (b) Explain nested sub queries with example.
  - (c) Explain the extended relational algebra operators with example.
  - (d) Explain the concurrency control.
7. Answer any **three** out of **four** : 15
- (a) Write short note on domain relational calculus.
  - (b) Write a short note on transaction management.
  - (c) Explain the term generalization, specialization and aggregation.
  - (d) Explain the difference between Procedures and Functions.
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- N.B. :** (1) All Questions are **compulsory**.  
 (2) Draw **neat and labelled** diagram wherever **necessary**.  
 (3) **Figures** to the **right** indicate **full marks**.

1. Answer any **two** out of **three** : 10
  - (a) Explain DBMS and its purpose in detail.
  - (b) Explain DML and DDL in detail with examples.
  - (c) What are the advantages of Relational Database Management Systems?
  
2. Answer any **two** out of **three** : 10
  - (a) Write a short note on Transaction Management in DBMS.
  - (b) What is data model? Explain the hierarchical database.
  - (c) Explain the difference between Delete and Truncate command.
  
3. Answer any **two** out of **three**: 10
  - (a) What is Normalization? What are its type? Explain in detail.
  - (b) What are different levels of data abstraction?
  - (c) Write a short note of ER diagram with example.
  
4. Answer any **two** out of **three** : 10
  - (a) What are joins? How many types of joins are there? Explain with example.
  - (b) Explain Constraint in detail with example.
  - (c) Write a short note on Aggregation and Generalization.
  
5. Answer any **two** out of **three** : 10
  - (a) Explain Primary and Foreign keys with example.
  - (b) Explain ACID properties in DBMS.
  - (c) Explain different types of database users.
  
6. Answer any **two** out of **three** : 10
  - (a) Explain Group By clause in DBMS with example.
  - (b) List and explain any five aggregation functions in DBMS with example.
  - (c) Explain selection and projection operator in detail.
  
7. Answer any **two** out of **three**: 10
  - (a) What is the difference between Relational Algebra and Relational Calculus?
  - (b) Explain Function and Procedure in detail with example.
  - (c) What are Triggers in DBMS? Write its advantages.
  
8. Answer any **two** out of **three** : 10
  - (a) Explain the concurrency control.
  - (b) What is composite keys? In reference to that also explain Partial dependency.
  - (c) What are the disadvantages of using lock-based protocols?

Con. 566-19.

Data Communication and Networking

(3 Hours)

Standard

[Total Marks : 100]

**N.B. : All questions from Q. 1 to Q. 7 are compulsory.**

1. Attempt the following :—
  - (a) Explain the bandwidth of signal and media. 5
  - (b) What is computer network ? Explain the components of data communication. 5
2. Attempt any **three** from the following :—
  - (a) What is protocol ? Explain the elements of protocol. 5
  - (b) Explain the Half Duplex and Full Duplex. 5
  - (c) Explain signal propagation. 5
  - (d) Explain the analog and digital signal. 5
3. Attempt any **three** from the following :—
  - (a) Explain OSI reference model with the help of neat and labeled diagram. 5
  - (b) What is TCP/IP protocol suite ? 5
  - (c) Write short note on Physical layer and Application layer. 5
  - (d) What is network model ? Explain addressing IPv4. 5
4. Attempt any **three** from the following :—
  - (a) Define multimedia. Discuss any two examples of applications of multimedia. 5
  - (b) Explain data compression ? State and explain types of compression. 5
  - (c) Explain error classification. 5
  - (d) Write short note on redundancy and hamming distance. 5
5. Attempt any **three** from the following :—
  - (a) What do you mean by data and signals ? 5
  - (b) Describe periodic analog signals with example. 5
  - (c) What is analog to digital and digital to analog conversion ? 5
  - (d) What is guided and unguided media ? Give one example of each media. 5
6. Attempt any **three** from the following :—
  - (a) What is the Network topology ? Explain bus and hybrid topology. 5
  - (b) Explain packet switching with the help of diagram. 5
  - (c) What is routing ? Explain with example. 5
  - (d) Write short note on message switching. 5
7. Attempt any **three** from the following :—
  - (a) Explain IPv6 Header format. 5
  - (b) What is IPv6 transition mechanism ? 5
  - (c) Explain IPv6 extension headers. 5
  - (d) Write short note on IPv6 auto configuration via DHCP. 5

[ TURN OVER

(3 Hours)

[Total Marks : 80

**N.B. :** (1) All questions from Q. 1 to Q. 8 are compulsory.

(2) Each question carries 5 marks.

(3) Attempt any two sub-questions from each question.

- |  |   |
|--|---|
| 1. (a) What is analog and digital signal ? Explain with example.                 | 5 |
| (b) Explain the concept of bandwidth of a signal.                                | 5 |
| (c) Explain Half Duplex and Full Duplex.   | 5 |
| 2. (a) Explain the application and network layers of OSI reference model.        | 5 |
| (b) Draw the OSI reference model and explain its working.                        | 5 |
| (c) What is TCP/IP protocol suite ?  | 5 |
| 3. (a) Write short note on error detection.                                      | 5 |
| (b) Explain data compression types.  | 5 |
| (c) What is multimedia ? Explain.  | 5 |
| 4. (a) Define Computer Network and explain the components of data communication. | 5 |
| (b) Write short note on addressing IPv6.   | 5 |
| (c) Explain checksum with example.   | 5 |
| 5. (a) What is transmission impairment ? Explain.                                | 5 |
| (b) Write short note on digital to digital and analog to analog conversion.      | 5 |
| (c) Explain guided media and unguided media in brief.                            | 5 |
| 6. (a) What is routing ? What is the use of routing ?                            | 5 |
| (b) Explain switching basics with the help of diagram.                           | 5 |
| (c) What is topology ? Explain Mesh, Star and Ring topology.                     | 5 |
| 7. (a) Describe IPv6 header format.  | 5 |
| (b) What is IPv6 address ?   | 5 |
| (c) Explain IPv6 auto configuration via DHCP.                                    | 5 |
| 8. (a) Explain digital to analog and analog to digital conversion.               | 5 |
| (b) Explain circuit switching with example.                                      | 5 |
| (c) Explain IPv6 transition.   | 5 |