Total No. of Questions : 8]

SEAT No. : ____

P660

[Total No. of Pages : 2

[5869]-290

S.E. (Information Technology)

SOFTWARE ENGINEERING

(2019 Pattern) (Semester - IV) (214454)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is Software Architecture? Explain Data centered and object oriented architectural style of the system. **[9]**

b) Explain guidelines for component level design and principles for User Interface design. **[9]**

OR

Q2) a) What are elements of Design model? What are the elements of architectural design? Explain Design principles? **[9]**

b) Explain the following fundamental software design concepts : **[9]**

i) Abstraction
ii) Architecture
iii) Patterns

Q3) a) What is Work Breakdown Structure? How is it related with scope management and explain 8/80 rule. **[8]**

b) Calculate activity expected time and variance for given problem. **[9]**

Activity ID	Optimistic Time (t_o)	Most Likely Time (t_m)	Pessimistic Time (t_p)
Job 1	1	3	5
Job 2	2	6	9
Job 3	2	3	5
Job 4	5	8	10
Job 5	11	15	20
Job 6	2	5	8
Job 7	3	3	3
Job 8	2	4	6

OR

P.T.O.

Q4) a) What is COCOMO II? What areas does COCOMO II address? **[9]**

b) Explain Information domain values (any 4). **[8]**

Q5) a) Discuss Garvin's eight Quality Dimensions. **[8]**

b) List out ISO 9126 Quality Factors. **[9]**

OR

Q6) a) Enumerate seven Principles of Testing. **[9]**

b) How Defects are managed? Explain. **[8]**

Q7) a) What is software SCM repository? Explain the features of tool set supporting SCM Repository. **[9]**

b) What is configuration identification in SCM? **[9]**

OR

Q8) a) What is Software Reuse? Explain benefits and Drawbacks of software reuse. **[9]**

b) Write short note on : **[9]**

i) Test Driven Development (TDD).

ii) Collaborative development.

Total No. of Questions : 8]

SEAT No. : [ ]

PA-1250

[Total No. of Pages : 2

[5925]-273

S.E. (Information Technology)

SOFTWARE ENGINEERING

(2019 Pattern) (Semester - IV) (214454)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answers Question 1 or 2, 3 or 4, 5 or 6, 7 or 8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is Software Architecture? Explain Data flow and Layered architectural style of the system. **[9]**

b) What is functional independence? Differentiate between coupling functional independence and Cohesion functional independence. **[9]**

OR

Q2) a) What are the characteristics of a good design? Explain Software Quality Guidelines and Attributes of software design. **[9]**

b) Explain design concepts : **[9]**

i) Pattern

ii) Information Hiding

iii) Modularity

Q3) a) Explain : **[9]**

i) 4P's of Project Management

ii) Software Project Estimation

b) What is Decomposition Technique? Explain Decomposition of Problem and Decomposition of Process. **[9]**

OR

P.T.O.

Q4) a) Explain Boehm's W^5HH Principle. **[5]**

b) What is the difference between PERT & CPM, state their application. What is the importance of critical path in a project? **[9]**

c) Explain typical Problems with IT Cost Estimates. **[4]**

Q5) a) Explain McCall's Quality Factors. **[9]**

b) Discuss Garvin's eight Quality Dimensions. **[8]**

OR

Q6) a) Explain Unit Testing? Which testing scheme is suitable to remove conflict of interest? **[9]**

b) How do you justify the statement "quality is a complex and multifaceted concept". **[8]**

Q7) a) Explain any Four layers of SCM process in detail. **[8]**

b) Explain CASE taxonomy. **[9]**

OR

Q8) a) Explain in brief risk mitigation, monitoring and management. **[9]**

b) Write short note on: **[8]**

i) JIRA

ii) Kanban

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Total No. of Questions : 8]

SEAT No. :

P659

[Total No. of Pages : 2

[5869]-289
S.E. (Information Technology)
COMPUTER GRAPHICS
(2019 Pattern) (Semester - IV) (214453)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the basic transformation techniques in 3D Graphics. **[6]**

i) Scaling ii) Rotation iii) Translation

b) Use the Cohen-Sutherland algorithm for clipping window having clipping window whose lower left point at (2,1), upper right point at (7,5) and line points are (1,3) and (5,6). Find the intersection points. **[6]**

c) Explain the following term with example **[6]**

i) Windowing ii) Clipping iii) Viewport

OR

Q2) a) Explain with diagram parallel and perspective projection. **[6]**

b) Explain 3D Transformation rotation about arbitrary axis. **[6]**

c) Using Sutherland-Hodgeman method, Clip Polygon ABCDE against window PQRS. The coordinators of polygon are A(80,200), B(220,120), C(150, 100), D(100, 30), E(10, 120). Coordinates of the window are P(200, 50), Q(50, 150), R(200,150), S(50, 50). **[6]**

Q3) a) What is segment? Explain different operations on segment with example. **[6]**

b) Explain RGB, HSV and HLS color models. **[6]**

c) Explain with diagram Gourand shading algorithm in detail. **[5]**

OR

P.T.O.

Q4) a) Explain the concept of segment table and display file. **[6]**

b) Explain with diagram Phong shading algorithm in detail. **[6]**

c) Define color gamut. Explain with diagram CIE Chromaticity Diagram. **[5]**

Q5) a) Differentiate between Bezier curve and B-spline curve. **[6]**

b) Write a short note on Interpolation and approximation. **[6]**

c) Explain various types of animation languages. **[6]**

OR

Q6) a) Explain Bezier curve. List its properties. **[6]**

b) Write short notes on: **[6]**

i) Koch curve

ii) Frame-by-frame Animation techniques

c) What is fractal? Explain Hilbert curve in detail **[6]**

Q7) a) What is the different usage of Virtual Reality? Explain in detail. **[6]**

b) What is Haptics Rendering Pipeline Modeling in Virtual Reality? **[6]**

c) Differentiate HMD and CAVE in Virtual Reality. **[5]**

OR

Q8) a) Explain the Graphics Rendering Pipeline. **[6]**

b) Explain the applications of Virtual Reality systems. **[6]**

c) Explain 3D position trackers. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PA-1249

[Total No. of Pages : 2

[5925]-272

S.E. (Information Technology)

COMPUTER GRAPHICS

(2019 Pattern) (Semester - IV) (214453)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers : Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain with diagram Cohen Sutherland line clipping algorithm. **[6]**

b) Compare homogeneous co-ordinate system and normalized co-ordinate system. **[6]**

c) Show that the Transformation matrix of reflection about line y=x is equivalent to reflection relative to x-axis followed by anticlockwise rotation of 90 degree. **[6]**

OR

Q2) a) What is the concept of vanishing point in perspective projection? Explain with diagram. **[6]**

b) Let ABCD be a rectangle window with A(20,20), B(90,20), C(90,70), D(20,70). Find the region codes for the end points & use Cohen Sutherland line clipping algorithm to clip the following line Q1Q2 with Q1(10,10) and Q2(70,60). **[6]**

c) Explain 3D reflection about XY, YZ, and XZ plane. **[6]**

Q3) a) What is Shading. Explain with diagram Constant intensity shading method. **[6]**

b) Explain CMY and HSV color models. **[6]**

c) What is a segment? How do we create it? Why do we need segments? **[5]**

OR

P.T.O.

Q4) a) Compare Gourand and Phong method of shading. **[6]**

b) What is segment? Explain the concept of segment table and display file. **[6]**

c) Explain CIE chromaticity diagram; also explain how RGB to CMY conversion is done **[5]**

Q5) a) Explain Koch curve and its application in detail. **[6]**

b) Write short notes on **[6]**

i) Morphing

ii) Design of animation sequence

c) What is fractal? Explain Hilbert curve in detail. **[6]**

OR

Q6) a) Write short notes on **[6]**

i) B-spline curve

ii) Blending function of Bezier curve

b) What are the methods of controlling animation? **[6]**

c) Explain various types of animation languages. **[6]**

Q7) a) Explain the physical modeling in Virtual Reality. **[6]**

b) Explain haptic feedback in Virtual Reality system. **[6]**

c) What is navigation and manipulation interfaces in virtual reality system? **[5]**

OR

Q8) a) Explain the behavioral modeling in Virtual Reality. **[6]**

b) What are sound displays in Virtual Reality? **[6]**

c) Explain Kinematic modeling in Virtual Reality. **[5]**

Total No. of Questions : 8]

SEAT No. :

P984

[Total No. of Pages : 3

[5869]-288
S.E. (Information Technology)
DATABASE MANAGEMENT SYSTEM
(2019 Pattern) (Semester - IV)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***
5) ***Use of Scientific calculator is permitted.***

Q1) a) Consider following database: **[6]**

Student (Roll_no, Name, Address)

Subject (Sub_code, Sub_name)

Marks (Roll_no, Sub_code, marks)

Write following queries in SQL:

i) Find average marks of each student, along with the Roll_no of student of subject code 'CE2412'.

ii) Find how many students have failed in the subject "DBMS".

iii) Construct suitable view on above schema.

b) Explain on delete cascade command with suitable example. **[5]**

c) What are different types of jois in SQL? Explain with suitable example. **[7]**

OR

Q2) a) Explain with suitable example SQL aggretage functions. **[6]**

b) Write the syntax for following SQL commands: **[6]**

i) create table ii) alter table

iii) drop table iv) insert

v) delete vi) update

c) Write and explain SQL function and procedures with sample example. **[6]**

P.T.O.

Q3) a) Explain with example Materialized evaluation and pipelining **[6]**

b) Consider following relational table. Find nontrivial and trivail functional dependency. **[5]**

A	B	C
a_1	b_1	c_1
a_1	b_1	c_2
a_2	b_1	c_1
a_2	b_1	c_3

c) List the desirable properties of decompostion. Explain loss less join with example. **[6]**

OR

Q4) a) Consider the following Book Relation. **[5]**

Book (Book_id, Title, Author, Publisher, Year, Price)

Write relational algebra expression for the following.

i) Display all book title with authors and price.

ii) Display the titles of book having price greater than 300.

iii) Display books publish in year 2000.

iv) Display all books published by 'PHP' with price greater then 300.

b) What are the measure of query cost? **[7]**

c) Define query processing. What are the steps involved in query processing? **[5]**

Q5) a) What is a deadlock? Explain deadlock recovery techniques. **[6]**

b) If we are to ensure atomicity, all the sites in which a transaction T executed must agree on the final outcome of the execution T must either commit at all sites, or it must abort at all sites. Describe the Two Phase Commit Protocol used to ensure this property in detail. **[8]**

c) How does the granularity of data items affect the performance of concurrency control? What factors affect the selection of granularity size of data items? **[4]**

OR

Q6) a) Explain deadlock prevention and Recovery. **[8]**

b) Illustrate difference between conflict serializable schedule and view serializable schedual by an appropriate example. **[6]**

c) What are the types of errors that may cause a tansaction to fail? **[4]**

Q7) a) Explain 2-tier and 3-tier architecture with diagram for online Banking Database system. **[6]**

b) Explain any two parallel Database System Architecture in detail. **[6]**

c) Enlist the Advantages & Disadvantages of Replication **[5]**

OR

Q8) a) What are different data fragmentation techniques in distributed databases? **[6]**

b) Write a short note on Centralized and Distributed Database Systems. **[6]**

c) Explain need of partitioning techniques used in I/O parallelism. Explain techniques in detail. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PA-1248

[Total No. of Pages : 3

[5925]-271

S.E. (Information Technology)

DATABASE MANAGEMENT SYSTEM

(2019 Pattern) (Semester - IV) (214452)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of scientific calculator is permitted.***

Q1) a) What are different types of joins in SQL? Explain with suitable example. **[6]**

b) Consider the following Relations. It defines the schema of the database application for a bank. It manages the branches and customers of the bank. Customers take loans (borrow money) or open accounts (deposit money) at one or more branches. **[8]**

Branch (B_No, B_name, B_city, asset), Customer (C_No,C_Name, C_citystreet)

Loan(Loan_no, B_name, amount), Account (Acc_No, B_name, Balance)

Borrower (C_No, Loan_No), Depositor (C_No, Acc_No)

Answer the following queries in SQL :

1) Find the names and address of customers who have a loan.
2) Find the total amount of balance of all the accounts
3) List all the customers who are borrowers
4) Find all the accounts of "shivaji nagar" branch of Pune city.

c) What is trigger? State and explain two categories of Triggers. **[4]**

OR

P.T.O.

Q2) a) Explain with suitable example SQL aggregate functions. **[6]**

b) Consider the following database. **[6]**

Doctor (Doctor_no, Doctor_name, Address, City).

Hospital (Hospital_no, Name. Street, City).

Doc_Hosp (Doctor_no, Hospital_no, Date).

Construct the following Queries in SQL.

1) Find out all Doctors who have visited to Hospital in same city in which they live.

2) Find to which Hospital "Dr. Joshi" has visited.

3) Count no. of Doctors visited to "Shree Clinic" on 1st March 2014.

c) What is Cursor? State and explain two categories of Cursors and their syntax. **[6]**

Q3) a) Define Database normalization. Explain any two normal form with the suitable example. **[8]**

b) Why is query optimization important for databases? **[5]**

c) Explain role of "Selection" operation in query processing. **[4]**

OR

Q4) a) State & Explain Armstrong's axioms& its properties. **[6]**

b) Define Boyce Codd normal form. How does it differ from 3NF? Why is considered a stronger form of 3NF. **[6]**

c) What is query processing? Explain query processing steps with neat sketch. **[5]**

Q5) a) What is transaction? Explain ACID properties of transaction. **[6]**

b) What is deadlock? Explain how deadlock detection and prevention is done. **[8]**

c) What is the need of two phase locking protocol? Explain. **[4]**

OR

Q6) a) What is Serializable schedule? Explain with suitable example the types of serializable schedules. **[6]**

b) What is concurrency control? Explain time stamp based concurrency control. **[8]**

c) Write short note on : Shadow paging. **[4]**

Q7) a) Differentiate between centralized and client server architecture. **[6]**

b) State and explain key elements of parallel database. **[6]**

c) Explain Distributed database architecture with neat sketch. **[5]**

OR

Q8) a) Explain the concept of speed up and scale up in case of parallel databases. **[8]**

b) Explain cloud database in detail. Also expalin architecture along with components. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P658

[Total No. of Pages : 3

[5869]-287
S.E. (Information Technology)
PROCESSOR ARCHITECTURE
(2019 Pattern) (Semester - IV)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Discuss the steps in executing interrupts in PIC 18 microcontroller. **[7]**

b) Explain PIR (Peripheral Interrupt Request Register) IPR (Peripheral Interrupt Priority Register). **[8]**

c) Explain function of following LCD pins: **[3]**

i) RS

ii) RW

iii) EN

OR

Q2) a) Explain the interrupt structure of PIC18 along with IVT. **[8]**

b) Draw an interfacing diagram for 4×4 matrix keyboard with PICI8F microcontroller and explain it. **[6]**

c) Illustrate the use of following bits of INTCON2 register: **[4]**

i) INTEDG1

ii) TMR0IP

P.T.O.

Q3) a) List the steps involved in programming PIC microcontroller in capture mode. **[6]**

b) Explain RS232 standard with suitable diagram. **[6]**

c) Write short note on SPI protocol. **[5]**

OR

Q4) a) Write the steps involved in programming compare mode of CCP1 module in PIC18F458. **[6]**

b) Write short note on 12C bus. **[6]**

c) Distinguish between synchronous and asynchronous serial communication. **[5]**

Q5) a) Explain in detail the functions of ADCON0 SFR of PIC18 microcontroller. **[7]**

b) Draw and explain the interfacing diagram of DAC0808 with PIC18FXXX. **[7]**

c) Explain the significance of ADC's EOC and SOC signals. **[4]**

OR

Q6) a) Draw and explain the interfacing of LM34/LM35 with PIC18FXX for temperature measurement using on - chip ADC. **[8]**

b) A PIC 18 is connected to the 4MHz crystal oscillator. Calculate the conversion time if we want to use only ADCS bits of the ADCON0 register. **[6]**

c) List out the steps necessary for reading from EEPROM of PIC18 **[4]**

Q7) a) Draw and explain ARM core dataflow model. **[6]**

b) What are the main features of ARM7 architecture? How it is different from pure RISC processor? **[6]**

c) Describe the major Design Rules of RISC philosophy? List the features of RISC processor accepted by ARM processor. **[5]**

OR

Q8) a) Draw and explain the ARM family core architecture. **[6]**

b) Why does ARM use CPSR? Explain the program status register? **[7]**

c) Draw and explain programmers model of ARM processor. **[4]**

Total No. of Questions: 8]

SEAT No. : ____

PA-1247

[Total No. of Pages : 2

[5925]-270
S.E. (Information Technology)
PROCESSOR ARCHITECTURE
(2019 Pattern) (Semester-IV) (214451)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write a short note on interrupt structure of PIC18 microcontroller. **[7]**

b) Justify the importance of Interrupt Control Register (INTCON) in PIC18F. **[7]**

c) Explain RCIF and TXIF flag in programming serial communication interrupt. **[4]**

OR

Q2) a) Draw an interfacing diagram for 16X2 LCD with PIC18 F microcontroller and explain its working. **[8]**

b) Write the short note on: **[6]**

i) ISR

ii) IVT

c) Differentiate between interrupt and polling. **[4]**

Q3) a) Explain the working of compare mode of CCP Module in PIC18F with block diagram. **[6]**

b) Write short note on SPI protocol. **[6]**

c) Distinguish between synchronous and asynchronous serial communication. **[5]**

OR

Q4) a) List the steps involved in programming PIC microcontroller in capture mode. **[6]**

b) Write short note on I2C bus. **[6]**

c) Explain UART module in PIC18F. **[5]**

P.T.O.

Q5) a) Explain in detail the functions of ADCON1 SFR of PIC18 microcontroller. **[7]**

b) State the features of RTC. Explain function of following pins of DS1306 **[7]**

i) SERMODE
ii) SDI
iii) SDO

c) Find the value for the ADCON0 register if we want FOSC/8, Channel 0, and ADON on. **[4]**

OR

Q6) a) Draw and explain the interfacing diagram of DAC0808 with PIC18FXXX. **[8]**

b) Assuming that R=5 Ω and Iref=2 mA for DAC0808, calculate Vout for the following binary inputs: **[6]**

i) 10011001 (99H)
ii) 11001000 (C8H)
iii) 10001000 (88H)

c) Explain in detail the functions of following flags related to onboard ADC of PIC18 microcontroller. **[4]**

i) GO/DONE
ii) ADON

Q7) a) Describe the ARM bus technology. **[6]**

b) Compare the ARM7, ARM9 and ARM11 processors. **[6]**

c) Discuss the different exceptions in ARM processor. **[5]**

OR

Q8) a) Explain CPSR register of ARM. **[6]**

b) Write significance of special registers R13, R14 and R15 in ARM7. **[6]**

c) Write short note on ARM7 processor modes. **[5]**

Total No. of Questions : 9]

SEAT No. :

P657

[Total No. of Pages : 6

[5869] - 286
S.E. (Computer/Information Technology)
ENGINEERING MATHEMATICS - III
(2019 Pattern) (Semester - IV)

Time : 2 ½Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Attempt Q2. or Q.3, Q4 or Q5, Q6 or Q7, Q8 or Q9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Write the correct option for the following multiple choice questions.

a) For a given set of bivariate data, $\bar{x} = 2, \bar{y} = -3$. The regression coefficient of x on y is –0.11. By using the regression equation of x on y , the most probable value of x when y=0 is _____. **[2]**

i) 0.57 ii) 0.87

iii) 0.77 iv) 1.77

b) If Probability density function $f(x)$ of a continuous random variable x is defined by

$$f(x) = \begin{cases} \frac{1}{4}, -2 \le x \le 2 \\ 0, \text{otherwise} \end{cases}$$

then $P(x \le 1)$ is _____. **[2]**

i) $\frac{1}{4}$ ii) $\frac{1}{2}$

iii) $\frac{1}{3}$ iv) $\frac{3}{4}$

c) Lagrange's polynomial through the points

x	0	1	2
y	4	0	6

is given by _____. **[2]**

i) $y = 5x^2 - 3x + 4$ ii) $y = 5x^3 + 3x + 4$

iii) $y = 5x^2 - 9x + 4$ iv) $y = x^2 - 9x + 4$

d) Using Gauss elimination method, the solution of system of equations

$x + \frac{1}{4}y + \frac{1}{4}z = 1, \frac{15}{4}y - \frac{9}{4}z = 3, \frac{5}{4}y - \frac{19}{4}z = 3$ is _____ **[2]**

i) $x = 1, y = 2, z = 3$ ii) $x = \frac{1}{2}, y = 1, z = \frac{1}{2}$

iii) $x = 2, y = \frac{1}{2}, z = 2$ iv) $x = 1, y = \frac{1}{2}, z = -\frac{1}{2}$

e) The first four central moments of a distribution are 0,16,–64 and 162. The coefficient of Kurtosis β_2 is _____. **[1]**

i) 1.20 ii) 0.6328

iii) 1 iv) 0.3286

f) If $f(x)$ is continuous on $[a,b]$ and $f(a)f(b)<0$. then to find a root of $f(x)=0$, initial approximation x_0 by bisection method is _____. **[1]**

i) $x_0 = \frac{a-b}{2}$ ii) $x_0 = \frac{f(a)+f(b)}{2}$

iii) $x_0 = \frac{a+b}{2}$ iv) $x_0 = \frac{a-b}{a+b}$

Q2) a) If marks scored by five students in statistics test of 100 marks, are given in following table. **[5]**

Student	1	2	3	4	5
Marks(/100)x	46	34	52	78	65

Find standard deviation and arithmetic mean $\bar{x}$.

b) Fit a law of the form $y=ap+b$ by least square method for the data, **[5]**

p	100	120	140	160	180	200
y	0.9	1.1	1.2	1.4	1.6	1.7

c) If the two lines of regression are $9x+y-\lambda=0$ and $4x+y=\mu$ and the means of x & y are 2 & –3 respectively. Find values of λ,μ and correlation coefficient between x & y. **[5]**

OR

Q3) a) The first four moments of a distribution about 5 are 2,20,40 and 50. Find first four moments about mean, and β_1,β_2. **[5]**

b) Fit a parabola $y=ax^2+bx+c$, by using least square method to the following data, **[5]**

x	0	1	2	3
y	2	2	4	8

c) Calculate the coefficient of correlation from the following information,

$n=10$, $\sum x=40$, $\sum x^2=190$, $\sum y^2=200$, $\sum xy=150$, $\sum y=40$. **[5]**

Q4) a) Bag 1 contains 2 white and 3 red balls. Bag 2 contains 4 white and 5 red balls. One ball is drawn randomly from bag 1 and is placed in bag2. Later, one ball is drawn randomly from bag2. Find the probability that it is red. **[5]**

b) The expected number of matches those will be won by India in a series of five one day matches between India and England is three. If the probability of India's win in each match remains the same and the results of all the five matches are independent of each other, find the probability that India wins the series, using Binomial distribution. Assume that each match ends with a result. **[5]**

c) The lifetime of an article has a normal distribution with mean 400 hours and standard deviation 50 hours. Find the expected number of articles out of 2,000 whose lifetime lies between 335 hours to 465 hours. (Given : Z=1.3,A=0.4032) **[5]**

OR

Q5) a) Find the expected value of the number of heads obtained when three fair coins are tossed simultaneously. **[5]**

b) On an average, 180 cars per hour pass a specified point on a particular road. Using Poisson distribution, find the probability that at least two cars pass the point in any one minute. **[5]**

c) The proportions of blood types O,A,B and AB in the general population of a country are known to be in the ratio 49:38:9:4 respectively. A research team observed the frequencies of the blood types as 88,80,22 and 10 respectively in a community of that country. Test the hypothesis at 5% level of significance that the proportions for this community are in accordance with the general population of that country. (Given : χ^2_{tab}=7.815) **[5]**

Q6) a) Find the root of the equation $x^4+2x^3-x-1=0$, lying in the interval [0,1] using the bisection method at the end of fifth iteration. **[5]**

b) Find a real root of the equation $x^3+2x-5=0$ by applying Newton-Raphson method at the end of fifth iteration. **[5]**

c) Solve by Gauss-Seidel method, the system of equations:

$$20x_1 + x_2 - 2x_3 = 17$$

$$3x_1 + 20x_2 - x_3 = -18$$

$$2x_1 - 3x_2 + 20x_3 = 25$$ **[5]**

OR

Q7) a) Solve by Gauss elimination method, the system of equations:

$2x_1 + x_2 + x_3 = 10$

$3x_1 + 2x_2 + 3x_3 = 18$

$x_1 + 4x_2 + 9x_3 = 16$ **[5]**

b) Solve by Jacobi's iteration method, the system of equations:

$4x_1 + 2x_2 + x_3 = 14$

$x_1 + 5x_2 - x_3 = 10$

$x_1 + x_2 + 8x_3 = 20$ **[5]**

c) Use Regula-Falsi method to find a real root of the equation $e^x - 4x = 0$ correct to three decimal places. **[5]**

Q8) a) Using Newton's forward interpolation formula, find y at $x=8$ from the following data.

x	0	5	10	15	20	25
y	7	11	14	18	24	32

[5]

b) Evaluate $\int_0^1 \frac{dx}{x^2+1}$

using Simpson's $\frac{1}{3}^{rd}$ rule. (Take $h=0.2$) **[5]**

c) Use Euler's method, to solve $\frac{dy}{dx} = x + y,\ y(0) = 1$

Tabulate values of y for $x=0$ to $x=0.3$ (Take $h=0.1$) **[5]**

OR

Q9) a) Use Runge-Kutta method of 4th order, to solve

$\frac{dy}{dx} = xy,\ y(1) = 2$ at x=1.2 with h=0.2. **[5]**

b) Using Modified Euler's method, find y(0.2),

given $\frac{dy}{dx} + xy^2 = 0,\ y(0) = 2$ Take h=0.2 (Two iterations only) **[5]**

c) Using Newton's backward difference formula, find the value of $\sqrt{155}$ from the following data

x	150	152	154	156
$y = \sqrt{x}$	12.247	12.329	12.410	12.490

[5]

Total No. of Questions : 9]

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PA-1238

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S.E. (Computer/I.T./AI&ML)

ENGINEERING MATHEMATICS - III

(2019 Pattern) (Semester - IV) (207003)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Attempt Q2 or Q3, Q4 or Q5, Q6 or Q7, Q8 or Q9.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Write the correct option for the following multiple choice questions :

i) y : 1 2 3

x : 1 5 9

The least square fit of the form $x = ay + b$ to the above data is _____. **[2]**

a) $x = 2y - 5$

b) $x = 4y + 4$

c) $x = 4y + 1$

d) $x = 4y - 3$

ii) For two events A and B, $P(A) = \frac{2}{3}, P(B) = \frac{3}{8}$ and $P(A \cap B) = \frac{1}{4}$, then the events A and B are _____. **[2]**

a) mutually exclusive and independent

b) not mutually exclusive and not independent

c) independent, but not mutually exclusive

d) mutually exclusive, but not independent

P.T.O.

iii) Using Gauss elimination method, the solution of system of equations $x+4y-z=-5,\ y+\frac{5}{3}z=\frac{7}{3}$ and $-13y+2z=19$ is _____. **[2]**

a) $x=\frac{117}{71},\ y=-\frac{81}{71},\ z=\frac{148}{71}$

b) $x=\frac{71}{117},\ y=\frac{71}{81},\ z=\frac{71}{148}$

c) $x=-\frac{117}{71},\ y=\frac{81}{71},\ z=-\frac{148}{71}$

d) $x=1,\ y=2,\ z=0$

iv) If Lagrange's polynomial passes through $\begin{matrix} x & 0 & 1 \\ y & 1 & 2 \end{matrix}$ then $\int_0^1 y\,dx=$ _____. **[2]**

a) $\frac{2}{3}$

b) $\frac{3}{2}$

c) $\frac{1}{2}$

d) 3

v) If $\sum xy=2638,\ \bar{x}=14,\ \bar{y}=17,\ n=10$, then $\text{cov}(x,y)=$ _____. **[1]**

a) 25.8

b) 23.9

c) 20.5

d) 24.2

vi) If x_0, x_1 are two initial approximations to the root of $f(x) = 0$, by secant method the next approximation x_2 is given by _____. **[1]**

a) $x_2 = \frac{x_0 + x_1}{2}$

b) $x_2 = x_1 - \frac{f(x_1)}{f^1(x_1)}$

c) $x_2 = x_1 - \frac{(x_1 - x_0)}{(f_1 - f_0)} f_1$

d) $x_2 = x_1 + \frac{(x_1 + x_0)}{(f_1 + f_0)} f_1$

Q2) a) The first four moments of a distribution about 4 are –1.4, 17, –30 and 108. Obtain the first four central moments and coefficient of skewness & kurtosis. **[5]**

b) Fit a linear curve of the type $y = ax + b$, to following data, **[5]**

x	10	15	20	25	30
y	0.75	0.935	1.1	1.2	1.3

c) Find the correlation coefficient for the following data, **[5]**

Population density	200	500	400	700	800
Death rate	12	18	16	21	10

OR

Q3) a) Find coefficient of variability for following data, **[5]**

C.I.	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Freq. (f)	4	7	8	12	25	18	10

b) Fit a linear curve $y = ax + b$, by least square method to the data, **[5]**

x	100	120	140	160	180	200
y	0.9	1.1	1.2	1.4	1.6	1.7

c) The regression equations are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. The value of variance of x is 9. Find **[5]**

i) the mean values of x and y

ii) the correlation x and y and

iii) the standard deviation of y

Q4) a) Three factories A, B and C produce light bulbs. 20%, 50% and 30% of the bulbs are available in the market by factories A, B and C respectively. Among these, 2%, 1% and 3% of the bulbs produced by factories A, B and C are defective. A bulb is selected at random in the market and found to be defective. Find the probability that this bulb was produced by factory B. **[5]**

b) On an average, 20% of the computers in a firm are virus infected. If 10 computers are chosen at random from this firm, find the probability that at least one computer is virus infected, using Binomial distribution. **[5]**

c) The height of a student in a school follows a normal distribution with mean 190 cm and variance 80 cm^2. Among the 1,000 students from the school, how many are expected to have height above 200 cm? **[5]**

(Given : z = 1.118, A = 0.3686)

OR

Q5) a) A die is tampered in such a way that the probability of observing an even number is twice as likely to observe an odd number. Find the expected value of the upper most face obtained after rolling the die. **[5]**

b) The number of industrial injuries per working week in a factory is known to follow a Poisson distribution with mean 0.5. Find the probability that during a particular week, at least two accidents will take place. **[5]**

c) A pea cultivating experiment was performed. 219 round yellow peas, 81 round green peas, 61 wrinkled yellow peas and 31 wrinkled green peas were noted. Theory predicts that these phenotypes should be obtained in the ratios 9:3:3:1. Test the compatibility of the data with theory, using 5% level of significance. (Given : $\chi^2_{tab} = 7.815$) **[5]**

Q6) a) Obtain the root of the equation $x^3 - 4x - 9 = 0$ that lies between 2 and 3 by Newton-Raphson method correct to four decimal places. **[5]**

b) Solve $2x - \cos x - 3 = 0$ by using the method of successive approximations correct of three decimal places. **[5]**

c) Solve by Gauss – Seidel method, the system of equations : **[5]**

$$2x_1 + x_2 + 6x_3 = 9$$

$$8x_1 + 3x_2 + 2x_3 = 13$$

$$x_1 + 5x_2 + x_3 = 7$$

OR

Q7) a) Solve by Gauss elimination method, the system of equations : **[5]**

$4x_1 + x_2 + x_3 = 4$

$x_1 + 4x_2 - 2x_3 = 4$

$3x_1 + 2x_2 - 4x_3 = 6$

b) Solve by Jacobi's iteration method, the system of equations : **[5]**

$20x_1 + x_2 - 2x_3 = 17$

$3x_1 + 20x_2 - x_3 = -18$

$2x_1 - 3x_2 + 20x_3 = 25$

c) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position at the end of fifth iteration. **[5]**

Q8) a) Using Newton's backward difference formula, find y at x = 4.5 for the following data. **[5]**

x	1	2	3	4	5
y	3.47	6.92	11.25	16.75	22.94

b) Use Simpson's 3/8th rule, to estimate $\int_1^7 f(x)dx$ from the following data. **[5]**

x	1	2	3	4	5	6	7
$f(x)$	81	75	80	83	78	70	60

c) Use Euler's method to solve $\frac{dy}{dx} = x^2 + y$, $y(0) = 1$. Tabulate values of y for $x = 0$ to $x = 0.3$. (Take $h = 0.1$) **[5]**

OR

Q9) a) Use Runge-Kutta method of 4th order to solve $\frac{dy}{dx}=\frac{y-x}{y+x}, y(0)=1$ at $x = 0.2$ with $h = 0.2$. **[5]**

b) Using modified Euler's method, find $y(1.1)$. Given $\frac{dy}{dx}=2+\sqrt{xy}, y(1)=1.$ Take $h = 0.1$. (Two iterations only) **[5]**

c) Determine the value of $y=\sqrt{151},$ using Newton's forward difference formula, from the following data. **[5]**

x	150	152	154	156
$y=\sqrt{x}$	12.247	12.329	12.410	12.490

□□□