(2½ hours)

Total Marks: 75

N. B.: (1) **All** questions are **compulsory**.
(2) Make**suitable assumptions** wherever necessary and **state the assumptions** made.
(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a. What is software? Explain the characteristics of software.
b. Explain software development life cycle (SDLC) with the help of diagram.
c. Define software engineering and its layer with the help of diagram.
d. Write a short note on
   1. RAD Model
   2. TimeBox Model
e. What are functional and non-functional requirements of software?
f. Explain the three phases in SCRUM for agile project management.

2. Attempt *any three* of the following: **15**

a. Describe the different stages of system engineering process.
b. Explain the importance of system dependability and the causes of failure in system dependability.
c. Explain the legacy system in socio technical system that continues to provide essential services.
d. Explain the process of requirement engineering briefly.
e. Explain USE Case diagram with **online shopping:** Web customer **actor** uses some web site to make purchases online. Top levels USE CASES are **view items**, **make purchase** and **client register**. View items use case could be used by customer as top level use case if customer only wants to find and see some products. This use case could also be used as a part of make purchase use case. Client register use case allows customer to register on the web site, for example to get some coupons or be invited to private sales.
f. Explain briefly legacy system categories and its assessment with the help of example.

3. Attempt *any three* of the following: **15**

a. Define architectural design and explain the functions of architectural design.
b. Explain the three rules for user interface design process (UID).
c. Explain software project management briefly.
d. Briefly explain the risk identification and the types of risk in the process of risk management.
e. Explain the functions of quality assurance and its standards.
f. Describe why it is important to measure the software metrics.

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4. Attempt *any three* of the following: **15**

a. Explain system testing process.
b. Explain briefly verification and validation (V & V) process.
c. List and describe the static analysis check points involved in automated static analysis.
d. Write a short note on size oriented metrics of software measurement and find the effort for the project, assume that 310 FP (function point) are estimated in total, and average productivity based on past projects is 5.5 FP/person-month.
e. Explain any one type of metrics to estimate the software productivity.
   l Function points
   2 Object point
f. Calculate cyclomatic complexity using the control flow diagram for the given example:

```
IF A = 10 THEN
IF B > C THEN
A = B
ELSE
A = C
ENDIF
ENDIF
Print A
Print B
Print C
```

5. Attempt *any three* of the following: **15**

a. Explain process and product quality.
b. Explain the different levels of **CMMI** (capability maturity model introduced) framework.
c. Explain briefly **WSDL** (web service description language).
d. What are the benefit and problem of reusing software?
e. Briefly describe the concept of **SOA** (service oriented architecture) and the benefits of SOA.
f. Write a short note on SaaS(Software as a service).

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Q.P. Code: 36151

(Time: 2½ hours)

Total Marks: 75

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(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a. What is an embedded system? Classify embedded systems based on complexity and performance.
b. Explain the purpose of embedded systems in data communication.
c. State the differences between Harvard and Von-Neumann architecture.
d. State the advantages of programmable logic devices over fixed logic devices.
e. What is non-operational quality attribute? Explain the various non-operational quality attributes to be considered in any embedded system design.
f. Explain the significance of quality attributes maintainability in embedded system design context.

2. Attempt *any three* of the following: **15**

a. Give an overview of the various types of electronic control units employed in automotive applications.
b. Write a short note on memory map.
c. Explain the role of watch dog timer in embedded systems.
d. What is the purpose of memory testing in embedded systems?
e. State the importance of device driver.
f. What is the significance of memory in embedded firmware/systems? What is on-chip memory and off-chip memory? Explain FLASH memory in brief.

3. Attempt *any three* of the following: **15**

a. Compare and contrast microprocessor and microcontroller.
b. List and explain the data types of 8051.
c. What is port 0? Explain the dual role of port 0.
d. Write an embedded C program to toggle all bits of P0, P1 every 1/4 of a second.
e. Write an embedded C program to count up P1 from 0-99 continuously.
f. Write an embedded C program to convert ASCII digits of '4' and '8' to packed BCD and display them on P1.

4. Attempt *any three* of the following: **15**

a. List and explain any five factors to be considered in selecting a microprocessor.
b. Draw the architectural block diagram of 8051 and explain oscillator unit.
c. Write a short note on infinite loop.

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d. Briefly explain the structure of embedded program with example.
e. Describe the linking process for embedded programs.
f. What are remote debuggers? Explain.

5. Attempt *any three* of the following: 15

a. Explain the difference between the memory management of general purpose kernel and real-time kernel.
b. What are the various functional requirements that needs to be evaluated in the selection of an RTOS (Real Time Operating System)?
c. List the types of files generated on cross-compilation and explain any two types.
d. Explain the advantages and limitations of simulator based debugging.
e. What is EDLC? Why EDLC is essential in embedded product development?
f. Describe the various phases of Embedded Product Development Life Cycle.

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(Time: 2½ hours)

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1. Attempt *any three* of the following: **15**

a. What is Java Virtual Machine (JVM)? Explain JVM components.
b. Explain the following.
   (i) Autoboxing
   (ii) Conditional operator
c. Define Identifier. Explain rules for identifiers in Java.
d. List of and explain any five features of Java.
e. Explain the following methods of String.
   (i) length() (ii) equals() (iii) charAt() (iv) compareTo() (v) substring()
f. How is main() method of Java written? Explain it in detail.

2. Attempt *any three* of the following: **15**

a. When do we use switch-case statement? Explain it with example.
b. List and explain the types of classes in Java.
c. What is a constructor? Explain characteristics of constructor.
d. Write a program to illustrate the concept of method overloading.
e. What do you mean by variable arguments? Explain it with example.
f. When do we use 'foreach' loop? Explain it with example.

3. Attempt *any three* of the following: **15**

a. Differentiate between classes and interfaces.
b. What is a package? Write steps to create a package in Java.
c. What is an interface? How can we implement interface in a class?
d. Explain the following with example.
   (i) this (ii) super
e. Write a program to illustrate the concept of abstract method and abstract class.
f. Write a program to implement multilevel inheritance with default constructor in each class.

4. Attempt *any three* of the following: **15**

a. Write a short note on exception handling in Java.
b. Explain life cycle of a Thread.
c. How is a Vector different from an array? How can you create a Vector in Java?
d. Explain the use of enumeration datatype in Java.
e. Define Stream. Explain how we can write binary data to a file.
f. What are the different ways of creating a new Thread in Java?

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5. Attempt *any three* of the following: **15**

a. Create an applet to display "Java World", Change the text color to Red.

b. Create an AWT application to create a frame with a Button named "Square", a Label and a TextField. Enter a number in the TextField .Click of the Button should display square of that number in the Label.

c. What is the use of LayoutManager? Explain GridLayout and BorderLayout.

d. Explain the following Listener interfaces
   (i) KeyListener (ii) MouseListener

e. Explain checkbox class along with its constructors in detail.

f. What is the use of adapter classes? Explain any one Adapter class in detail.

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(2½ Hours)

[Total Marks: 75]

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(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a. Define the following
i) Range ii) Quartile deviation iii) Mean Deviation
iv) Standard deviation v) Variance

b. Calculate the mean and standard deviation for the following table giving the age distribution of 542 members

Age (in years)	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members	3	61	132	153	140	51	2

c. Calculate the Semi-inter quartile range, coefficient of variation for the following data

Wages	170-180	180-190	190-200	200-210	210-220	220-230	230-240	240-250
No. of persons	52	68	85	92	100	95	70	28

d. From the following data calculate Q_1 and Q_3 and Quartile deviation.

Marks more than	10	20	30	40	50	60	70
Number of Students	12	30	54	76	91	101	112

e. Find the Geometric mean for the following distribution

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	5	7	15	25	8

f. Compute Mean deviation and semi-interquartile range (Q. D.) for the following data

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	8	12	20	25	15	9	6	5	5

2. Attempt *any three* of the following: **15**

a. Obtain Karl Pearson's measure of skewness for the following data

Values	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	6	8	17	21	15	11	2

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b. Find the second, third and fourth central moments of the frequency distribution given below.

Class limits	110-114.9	115-119.9	120-124.9	125-129.9	130-134.9	135-139.9	140-144.9
Frequency	5	15	20	35	10	10	5

c. What is kurtosis? Explain types of kurtosis and measures of kurtosis.

d. A survey of 500 television viewers produced the following information; 285 watch football 195 watch hockey, 115 watch basketball, 45 watch football and basketball, 70 watch football and hockey, 50 watch hockey and basketball, 50 d not watch any of the tree games. Create a Venn diagram and then determine the probability that if a viewer is selected at random.

I. Watch all three games
II. Exactly one of the three games

e. If a pair of dice is thrown and X denotes the sum of the numbers on them. Find the probability distribution of X. Also find the expectation of X.

f. A random sample of 400 men is found to have a mean height of 69.2 inches and a standard deviation of 2.7 inches. Find

a) The 95 percent confidence limits of the true average height.
b) The 99 percent confidence limits of the true average height.

3. Attempt *any three* of the following: **15**

a. What is hypothesis test? Explain types of hypothesis. Explain level of significance.

b. A random sample of 100 balls selected from a large consignment of cricket balls gave 10% defective balls. Find 99% confidence limits for the percentage of defective balls in the consignment.

c. A survey of 40 retired women revealed the mean age at which their income was maximum to be 45 years with a standard deviation of 6.3 years. Find 95% confidence limits for the mean age of maximum earnings of women who survive till they retire.

d. A car manufacturer claims that 40% of all cars built by his concern will be still in running condition after 10 years. A random sample of 400 cars built by his concern showed that 150 cars were still in running condition after 10 years. Test the claim at 1% level.

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e. Obtain 99% confidence limits for the population mean using the following sample observations

Number of bananas	0-100	100-200	200-300	300-400	400-500
Number of Trees	2	11	15	9	5

f. Form the given sample of 100, 35 are working as a professor. Construct a 95% confidence interval for the probability that almost most of the education people from the sample are working as a professor.

4. Attempt *any three* of the following: **15**

a. 20% of apples in a large consignment are found to be bad. For the probability that at least 25% apples are bad in a sample size of 400 drawn from it.

b. It is known that 30% male adults are unmarried in a certain city. A sample of 100 male adults is selected at random from the city. Find the chance that the sample includes

i) 25% to 32% ii) at most 33% of an unmarried male adults

c. Twenty sample of size 100 each are selected from a very large consignment of blades. Find the expected number of samples that will have at least 14 defective blades if the consignment has 10% defective blades.

d. In an experiment of immunization of cattle from tuberculosis the following results were obtained.

	Affected	Unaffected
Inoculated	11	31
Not inoculated	14	4

Examine the effective of vaccine in control the incidence of the disease at 1% level of significance.

e. Using the data given in below table to decide whether we can conclude that standard of a salesman has significant effect on hD performance in field selling at 5% level of significance.

	Performance in field			Total
	Disappointing	Satisfactory	Excellent	
Poor dressed	21	15	6	42
Well dressed	24	35	26	85
Very well dressed	35	80	58	173
Total	80	130	90	300

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f.

Two sample polls of votes for two candidates. A and B for a public office are taken, one from among the residents of rural areas. The results are given in the adjoining table. Examine whether the nature of the area is related to voting preference in this election.

Area	Votes for		Total
	A	B	
Rural	620	380	1000
Urban	550	450	1000
Total	1170	830	2000

5. Attempt *any three* of the following: **15**

a. Fit a straight line trend value for the following series. Estimate the number of production units for 2002.

Year	1995	1996	1997	1998	1999	2000	2001
Production unit	125	128	133	135	140	141	118

b. Fit a parabola for the given data

X	0	1	2	3	4
Y	5	4	9	20	37

c. Explain the following

i) Coefficient of correlation

ii) Standard Error of Estimate

d. The following data relate to advertising and sales.

Advertising Expenditure	1	2	3	4	5
Sales	10	20	30	50	40

Obtain the two regression equations.

e. The marks obtained by 10 students in Mathematics (X) and Statistics (Y) are given below. Find the coefficient of correlation between X and Y.

Roll No	1	2	3	4	5	6	7	8	9	10
X	75	30	60	80	53	35	15	40	38	48
Y	85	45	54	91	58	63	35	43	45	44

f. On the basis of a sample size 27, a regression equation of y on x was found to be y = 0.25 + 2.00x. If $\sigma_{yx} = 3$ and $\sigma_{xy} = 750$ find 95% and 99% confidence limits for the regression coefficient.

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(Time: 2½ hours)

Total Marks: 75

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(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a. What is computer graphics? Explain computer graphics applications and software.
b. Explain the operation of CRT with a neat labelled diagram.
c. Distinguish between raster scan display device and random scan display device.
d. Consider a line AB with A= (0, 0) and B= (-5,-5). Apply a simple DDA algorithm and calculate the pixels on the line.
e. Explain the acceptance and rejection test using bit codes in Cohen-Sutherland line clipping algorithm. List the steps of the algorithm and give suitable example to explain the concept.
f. Explain Liang-Barsky algorithm for clipping a line and also find the clipping coordinates for a line PQ where P=(10,10) and Q=(60,30), against window with (x_{wmin},y_{wmin})=(15,15) and (x_{wmax},y_{wmax})=(25,25).

2. Attempt *any three* of the following: **15**

a. Describe transformations and matrices in detail.
b. Using homogeneous coordinate transformation matrix, rotate the triangle ABC with A= (2, 3), B= (5, 5), and C= (4, 3) by an angle 45^0 about the point (1, 1).
c. Write a short note on reflection through an arbitrary line in brief.
d. Shear a unit cube situated at origin with a shear transformation matrix:

$$T_{shear} = \begin{bmatrix} 1 & -0.85 & 0.25 & 0 \\ -0.75 & 1 & 0.7 & 0 \\ 0.5 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

e. Define vanishing point and also explain vanishing point in different perspective projection in detail.
f. What is meant by view volume? Explain it with different types of projections.

3. Attempt *any three* of the following: **15**

a. Explain with neat labelled diagram stages in 3D viewing pipeline.
b. Explain different coordinates systems and matrices in detail.
c. What is light? Explain Radiometry in brief.
d. Explain different properties of Bidirectional Reflectance Distribution Function (BRDF).

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e. Explain any two color spaces in detail.
f. Write a short note on chromatic adaptation.

4. Attempt *any three* of the following: 15

a. Write a short note on back face removal technique.
b. What is meant by BSP trees? Explain algorithm for construction of it with example.
c. Explain visible surface ray tracing in brief with neat labelled diagram.
d. Explain parametric representation of hyperbola.
e. Explain implicit and explicit curve representation in detail.
f. Explain Bezier Surfaces in detail and state it's any five properties.

5. Attempt *any three* of the following: 15

a. What is an animation? Explain any two principles of animation in detail.
b. Explain procedural techniques in brief.
c. Explain different types of deformation in detail.
d. What is an Image? Explain any five image formats.
e. Distinguish between lossy and lossless compression.
f. Explain the concept of histogram equalization. Equalize the following histogram for L=8.

Gray Level	0	1	2	3	4	5	6	7
No. of pixel	790	1023	850	656	329	245	122	81

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