Note: Answer five questions by selecting at least two questions from each section.
The normal distribution table is provided with the question paper.

SECTION - A

1. (a) Given
   \[ X \text{ (in degrees)} = 0 \quad 30 \quad 60 \quad 90 \]
   \[ Y = -1 \quad -0.366 \quad -0.366 \quad 1 \]
   Approximate \( Y \) by a \( \cos x + b \sin x \) in the least square sense.

   (b) Approximate \( \sqrt{x} \) by a \( x^2 + b \) in least square sense on \([0,1]\)

2. (a) Given \( Y'' = y - 4 \cos x, \ y(0) = 2, \ y'(0) = -1 \), find \( y(0.2) \) by Runge–Kutta
   method of order 4 by choosing \( h = 0.2 \).

   (b) Consider the boundary value problem
   \[ Y'' + y = 2 \cos x, \ y(0) + y'(0) = 0, \]
   \( Y(1) = 2 \). Solve it by finite difference method with \( h = \frac{1}{3} \).

3. (a) Given
   \[ \frac{dy}{dx} = z - x, \ y(0) = 1 \]
   \[ \frac{dz}{dx} = x + y, \ z(0) = 1 \]
   Calculate \( y(0.1) \) and then \( y(0.3) \) by Taylor series method of order 5.

   (b) Consider
   \[ \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = x^2 + y^2, \quad 0 \leq x, y \leq 1 \]
   with \( u(x,0) = x, \ u(0,y) = y, \ u(1,y) = 1+y \) and \( u(x,1) = 1+x, \ 0 \leq x, y \leq 1 \)
   Solve it by tabing \( h = \frac{1}{3} \)

4. (a) Consider
   \[ \frac{\partial u}{\partial t} + \frac{\partial^2 u}{\partial x^2}, \]
   \[ u(x,0) = x, \text{ if } 0 \leq x \leq \frac{1}{2} \]
   \[ = 1-x, \text{ if } \frac{1}{2} \leq x \leq 1 \]
   \( F(0,x) = f(1,x) = 0 \). Choose \( h = 0.2 \) and find the solution up to two time levels by
   Crank-Nicolson scheme.

   Contd….2,
(b) Given \( \frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2} \),
\( u(x,0) = x^2, \quad u(1,t) = 1 + t^2 \)
\( \frac{\partial u}{\partial t}(x,0) = 2x, \quad \frac{\partial u}{\partial x}(0, t) = 2t \)
Choose \( h = 0.2 \) and solve up to two time levels.

SECTION - B

5. (a) The joint pdf of a two-dimensional random variable \((x, y)\) is given by
\[
F(x, y) = e^{-y}, \quad x > 0, \quad y > x
\]
\[= 0, \text{ elsewhere} \]
Find the marginal pdf of \(x\) and \(y\). Also calculate \(P[x > 1| y < 5] \).

(b) If \(x\) and \(y\) are two independent random variables each having normal distribution
\(N(0, 2)\), then find the pdf of the random variable \(Z = X/Y\).

6. Let \((x, y)\) be a two-dimensional random variable uniformly distributed over the
triangular region \(R\) bounded by \(y = 0\), \(x = 3\) and \(y = \frac{4}{3}x\). Find \(E(x), E(y), \text{VAR}(x), \text{VAR}(y)\) and the correlation coefficient \(\rho\).

7. (a) Suppose that the life length of two electronic devices, say \(D_1\) and \(D_2\), have
distribution \(N(40, 36)\) and \(N(45, 9)\), respectively. If the electronic device is to be
used for 46 hour period, which device is to be preferred?

(b) A manufacturer claims that only 5\% of his products supplied by him are
defective. A random sample of 1000 products had 40 defectives. Test the claim of
the manufacturer.

8. The life length (of an item) \(T\) is exponentially distributed with parameter
\(\alpha = 0.002\). Suppose that 200 such items are tested, yielding observed values
\(T_1, T_2, \ldots, T_{200}\).

(a) What is the probability that \(450 < \overline{T} < 550\)?

(b) What is the probability that the largest observed value exceeds 5000 hrs?

(c) What is the probability that the shortest period is less than 50 hours?

Contd...3,
2013-14
M.TECH. I SEMESTER (AUTUMN) EXAMINATION
COMPUTER SCIENCE AND ENGINEERING
SOFTWARE ENGINEERING-I
CO-601

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question M.M.
1(a). With the help of a diagram discuss why software engineering is a layered technology. [06]
1(b). Discuss the activities(s) performed during the support phase of software engineering. [06]

OR

1'(a). With the help of a diagram discuss the common process framework that characterizes a software process. [06]
1'(b). Discuss some of the practitioner’s myths associated with software development. [06]

2(a). Explain the Component Based Development (CBD) software process model. Is making changes/improvements to the software easy or difficult when making use of the CBD? Justify your answer. [06]
2(b). Discuss the drawbacks associated with the Prototyping process model. [06]

OR

2'(a). Under what software project characteristics is the incremental model particularly useful? [06]
2'(b). Consider a project that has uncertain requirements and a deadline so tight that full functionality cannot be reasonably delivered. Which process model is best suited for such a project and why? [06]

Contd……...2
3 (a). What is an “indicator” when measuring software? Briefly explain the different kinds of indicators.

3 (b). How does the fishbone diagram help in performing failure analysis under statistical software process improvement?

OR

3'(a). Discuss metrics used to assess software quality. Are these metrics based on LOCs? What do these metrics indicate?

3'(b). Write the generic formula for an empirical estimation model for software. What does this mathematical model indicate regarding software estimation? How is it different from Function Point (FP) calculation?

4(a). Statistical SQA is applied to a complex project that was undertaken by a large software organization. After analysis, design, coding, testing, and release, the following data are gathered:

\[ E_i = \text{the total number of errors uncovered during the } i^{th} \text{ step in the software engineering process} = 139 \]
\[ S_i = \text{the number of serious errors} = 23 \]
\[ M_i = \text{the number of moderate errors} = 51 \]
\[ T_i = \text{the number of trivial errors} = 65 \]
\[ PS = \text{size of the product (LOC)} = 150,000 \]

Calculate the Phase Index (PI) at every step of the software development process if the weight factors are \( w_s = 10 \), \( w_m = 3 \), \( w_t = 1 \) during the analysis phase and each \( w \) increases by a factor of 2 for every subsequent step.

4(b). Explain a metric that can be used to measure software “reliability”. How can this metric also be used to measure “availability”?

5(a). Justify why coupling is an undesirable trait during modular design. Which is the worst form of coupling and why?

5(b). Find the cyclomatic complexity and the basis set for the pseudo code given below. Theoretically, what could be the minimum value of the cyclomatic complexity for

Contd....3
any given code?

<Initialization statements>
while (condition) AND (condition)
{
  <statement>
  <statement>
  if (condition) AND (condition)
  {
    then
    <statement>
    <statement>
    else
    <statement>
    <statement>
  }
}

if (condition)
{
  <statement>
  <statement>
}

********************************************************************************
2013-14
M.TECH. (AUTUMN SEMESTER) EXAMINATION
COMPUTER ENGINEERING
INTERACTIVE COMPUTER GRAPHICS
CO-609

Maximum Marks: 60 Credits: 04 Duration: Three Hours

Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

Q.No. Question M.M.
1(a) How is synthetic camera model different from pinhole camera in terms of projection? Explain using diagrams. [06]
1(b) Draw the block diagram of Graphics pipeline and briefly describe each phase of this pipeline. [06]

OR

1" Why is OpenGL so popular in computer graphics? Write a program using OpenGL to rotate a cube along Z-axis. [12]

2(a) What is a frame? Describe its usefulness through examples. What do you mean by convex hull? [06]
2(b) What is homogenous co-ordinate representation? How does it avoid difficulty in representation for points and vectors in three dimensions? [06]

OR

2" Explain the following transformations using examples in homogenous coordinate representation: Translation, Scaling, Rotation, Shear. [12]

3(a) What are the basic elements of viewing? Differentiate between parallel and perspective viewing. [06]
3(b) Briefly describe about all the geometric projections. [06]
4(a) Write short note on Rasterization. Define shading. [06]
4(b) Explain Phong model. [06]

5(a) What is the role of clipping in computer graphics? Explain Cohen-Sutherland clipping algorithm. [06]
5(b) What do you mean by rendering? Write the advantages of Liang-Barskey clipping algorithm. [06]
QNo | Question | MM
---|---|---
1 | Attempt any two parts. | 2*7.5=15
(a) | What type of knowledge is discovered in data mining process? Explain each briefly using a suitable example. | 
(b) | Differentiate between OLTP and OLAP systems. Also discuss various schema models and typical operations for a data warehouse. | 
(c) | Discuss various data cleaning tasks and the techniques to implement them. | 
2 | Attempt any two parts. | 2*7.5=15
(a) | What is an association rule? What types of association rules can be discovered? Assume that APRIORI algorithm identifies the following seven 4-itemsets that satisfy a given support threshold: acde, acdf, adfg, bode, bcdf, beef, cdef. What initial candidate 5-itemsets are created by the APRIORI algorithm? which of those survive subset pruning? | 
(b) | Write and explain the FP-growth algorithm. Find all the frequent item-sets for the following transaction database. Minimum support count is 3. | 

<table>
<thead>
<tr>
<th>TID</th>
<th>Items Bought</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>{K,A,D,B}</td>
</tr>
<tr>
<td>T2</td>
<td>{D,A,C,B,E}</td>
</tr>
<tr>
<td>T3</td>
<td>{C,A,B,E}</td>
</tr>
<tr>
<td>T4</td>
<td>{B,A,D}</td>
</tr>
</tbody>
</table>

Contd......2
K-NN (k-nearest-neighbor) classifiers are lazy classifiers. What does this mean? What is the disadvantage of using lazy classifiers? One challenge when using k-NN for classification is to find a proper value for the parameter k. Suggest an approach that determines a good value for k to solve a particular classification problem.

3 Attempt any two parts.
   (a) What is clustering? What characteristics a good clustering algorithm should possess? Agglomerative hierarchical clustering algorithms merge the pair of clusters that are the closest to each other. Is this always a good approach?
   (b) What are shortcomings of partitioning clustering? Discuss BIRCH clustering method in detail. what are its advantages and disadvantages?
   (c) What are opportunities and challenges in web mining? Discuss types of web mining in brief.

4 Attempt any two parts.
   (a) Discuss the structure of GOOGLE index. Also discuss how it is used in searching a query.
   (b) What is relevance feedback? Discuss the various type of feedback using suitable examples in detail.
   (c) Differentiate between focused and periodic crawler. Explain the following in context of crawlers:
       Pre-fetching Client
       Spider Traps
       DNS caching