

SECTION - D

7. (a) Why is a cycloidal motion programme the most suitable for high-speed cams? Explain with appropriate reasoning.
- (b) The following data relate to a symmetrical circular cam operating a flat-faced follower:
 Minimum radius of the cam 40 mm
 Lift 24 mm
 Angle of lift 75°
 Nose radius 8 mm
 Speed of the cam 420 rpm
 Determine the main dimensions of the cam and the acceleration of the follower at
- the beginning of the lift
 - the end of contact with the circular flank
 - the beginning of contact with the nose
 - the apex of nose. **(5+15=20)**
8. (a) What is balancing? Why is it required? Explain the ill effects of unbalanced parts in any machine with suitable examples.
- (b) Four masses A, B, C, and D are completely balanced. Masses C and D make angles 80° and 200° respectively with B in the same sense. The rotating masses have the following properties:
 $m_b = 25$ kg, $m_c = 50$ kg, $m_d = 35$ kg, $r_a = 150$ mm, $r_b = 200$ mm, $r_c = 100$ mm, $r_d = 180$ mm, planes B and C are 250 mm apart.
 Determine the mass A and its position; position of planes A and D. **(5+15=20)**

SECTION - E

9. (a) With simple example explain how structure is converted into a mechanism?
- (b) Explain how sliding pair is an extension of turning pair?
- (c) State the difference between cycloidal and involute tooth profile?
- (d) What are the advantages of helical gears over spur gears?
- (e) What is undercutting in cam? What is its significance in cam design?
- (f) Why tangent cam is not used with flat-faced follower?
- (g) What is pressure angle in cam? Explain its significance.
- (h) What is the material composition for V-belts? Write the advantages/disadvantages of such belts.
- (i) How are chain drives different to belt and rope drives? Enumerate with suitable examples.
- (j) Why flywheels are used in punching machines? **(2×10=20)**

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
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1365

B. Tech 3rd Semester Examination

Numerical Analysis and Computer Programming (O.S.)

AS(ID)-3001

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : There are five sections in all, section E is compulsory and attempt one question from each of the section A, B, C and D. Use of non programmable calculator is allowed.

SECTION - A

1. Construct Newton's forward interpolation polynomial for the following data:

x	4	6	8	10
y	1	3	8	16

Hence evaluate y for x = 5. (20)

2. What is flow chart? Explain symbols used in flow chart and draw a flow chart to find the roots of quadratic equation. (20)

SECTION - B

3. Find a root of the equation $x^3 - x - 11 = 0$, correct to three decimal places using bisection method. (20)
4. Apply Gauss- Seidel method to solve the equations $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$. (20)

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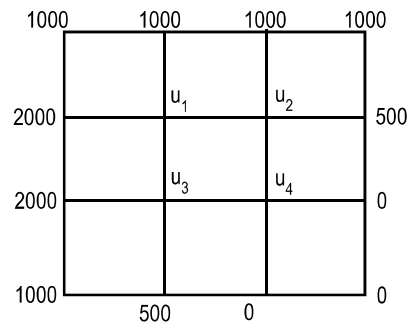
SECTION - C

5. Use Trapezoidal rule to evaluate $\int_0^1 x^3 dx$ considering five subintervals. (20)

6. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 3/8 rule. (20)

SECTION - D

7. Given the values of $u(x, y)$ on the boundary of the square in the Fig. below, evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u = 0$ at the pivotal points of this figure. (20)



8. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$; $u(0, t) = u(1, t) = 0$. Carry out computations for two levels taking $h = 1/3$, $k = 1/36$. (20)

SECTION - E

9. (i) Write the Newton's backward interpolation formula.
 (ii) In bisection method, the convergence is.....

- (iii) How will you differentiate between round-off and truncation error?
- (iv) Evaluate $\Delta^n(e^x)$, interval of differencing being unity.
- (v) As soon as new value of the variable is found by iteration it is used immediately in the following equation, this method is called.....
- (vi) What is numerical differentiation?
- (vii) Prove that $\nabla = 1 - E^{-1}$.
- (viii) Write Crank-Nicolson formula.
- (ix) Explain the data types used in C language.
- (x) What is structured English? **(10×2=20)**