OCTOBER 2012 **P/ID 17451/PCAA/ RCA**

Time : Three hours Maximum : 75 marks

PART A — (5 × 5 = 25 marks)

Answer ALL questions.

1. (a) Show that $(P \wedge (\neg P \vee Q)) \vee (Q \wedge \neg(P \wedge Q)) \Leftrightarrow Q$.

Or

(b) Find the number of ways 'm' that 12 students can be partitioned into three teams $A1$, $A2$ and $A3$, so that each team contains four students.

2. (a) Let $a = -381$ and $b = 14$. Find q and r such that $a = bq + r$ and $0 \leq r \leq |b|$.

Or

(b) Prove that a subset $S \neq \phi$ of a group G is a sub group of $(G, *)$ iff for any pair of elements $a, b \in S$, $a * b^{-1} \in S$.

3. (a) Find the real root of the equation $x^3 - 4x - 9 = 0$ by bisection method.

Or

(b) Find the root of the equation $x^3 + x^2 - 100 = 0$ by iteration method.

4. (a) Solve the system of equations by Gauss Jordan method.

$$x + y + z = 1$$
$$4x + 3y - z = 6$$
$$3x + 5y + 3z = 4.$$

Or

(b) Discuss on the procedure for LU decomposition to find the inverse.

5. (a) Evaluate $\int_0^{10} dx/(1+x^2)$ using

(i) Simpson's 1/3 rule and

(ii) Simpson's 3/8 rule.

Or

(b) Discuss on the principle of Romberg integration.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

6. Show that

$((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee$

$(\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a tautology.

7. Prove that the kernel of a homomorphism from a group $(G, *)$ to (H, Δ) is a normal subgroup of $(G, *)$.

8. Write a note on :
   (a) Integral domain.
   (b) Fields.

9. Determine the root of $xe^x - 3 = 0$ correct to 3 decimal places, using the method of false position.

10. Using Newton-Raphson method, establish the formula $x_{n+1} = \frac{1}{2}\left(x_n + N/X_n\right)$ to calculate the square root of N. Find the square root of 5 correct to four decimal places.

11. Solve the system of equations by Gauss Seidel.

$$83x + 11y - 4z = 95$$
$$7x + 52y + 13z = 104$$
$$3x + 8y + 29z = 71.$$

12. Solve the following equations by method of triangularisation.

$$2x + y + 4z = 12$$
$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33.$$

13. Use Romberg integration, evaluate $\int_{0.2}^{1.5} e^{-x^2} dx$ correct to 5 decimal places.

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