

OCTOBER 2012

P/ID 17451/PCAA/  
RCA

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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  $0 \leq r < |b|$ .  
Or  
(b) Prove that a subset  $S \neq \emptyset$  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.

$$\begin{aligned}x + y + z &= 1 \\4x + 3y - z &= 6 \\3x + 5y + 3z &= 4.\end{aligned}$$

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

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

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

7. Prove that the kernel of a homomorphism from a group  $(G, *)$  to  $(H, \Delta)$  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  $x_{n+1} = \frac{1}{2}(x_n + N/X_n)$  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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