

MAY 2015

P/ID 17451/RCA/  
PCAA

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Time : Three hours

Maximum : 75 marks

PART A — (5 × 5 = 25 marks)

Answer ALL questions.

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

Or

- (b) Write the following statement in symbolic form. If either Jerry takes calculus or Ken takes sociology, then Larry will take English.

2. (a) Show that  $S(n) = 1 + 2 + 3 \cdots + n = \frac{n(n+1)}{2}$  by using mathematical induction.

Or

- (b) Let  $\langle G, * \rangle$  and  $\langle H, \Delta \rangle$  be groups and  $g : G \rightarrow H$  be a homomorphism. Then prove that the Kernel of  $g$  is a normal subgroup.

3. (a) Find the real root of equation  $x^3 - 2x + 0.5 = 0$  by Newton's Raphson method.

Or

- (b) Find the real root of equation  $x^3 - 2x - 5 = 0$  using the bisection method in five stages.
4. (a) Using the Gauss-Jordan method solve the following equations  $10x + y + z = 12$ ;  
 $2x + 10y + z = 13$ ;  $x + y + 5z = 7$ .

Or

- (b) Apply factorisation method to solve the equations  $2x + 3y + z = 9$ ,  $x + 2y + 3z = 6$ ;  
 $3x + y + 2z = 8$ .
5. (a) Evaluate  $\int_0^1 e^{-x^2} dx$  by dividing the range of integration into 4 equal parts using Trapezoidal rule.

Or

- (b) Use the two-point Gauss quadrature to evaluate  $\int_0^{0.5} e^x dx$ .

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

6. (a) Define Tautology and Contradictions.

(b) Show that

$$\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$$

7. Prove that the order of a subgroup of a finite group divides the order of the group.

8. Find the root of  $xe^x = 3$  using the Regula-Falsi method correct to four decimal places.

9. Find the root of the equation  $x \sin x + \cos x = 0$  by using Newton-Raphson method.

10. Solve the system of equation  $28x + 4y - z = 32$ ;  
 $x + 3y + 10z = 24$ ;  $2x + 17y + 4z = 35$  using Gauss elimination method.

11. Apply Gauss-Seidal iteration method to solve the equation

$$8x - y + z = 18; 2x + 5y - 2z = 3; x + y - 3z = -6$$

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12. Evaluate  $\int_0^6 \frac{dx}{1+x^2}$  by using

(a) Simpson's 1/3 rule

(b) Simpson's 3/8 rule.

13. Evaluate  $\int_0^1 \frac{1}{1+x} dx$  correct to three decimal places using Romberg's method. Hence find the value of  $\log_e 2$ .

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