A

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. $P \to \neg Q$ is equivalent to   CO1-App

    (a) $\neg P \wedge Q$ (b) $P \wedge \neg Q$ (c) $\neg (P \wedge Q)$ (d) $P \vee \neg Q$

2. How many "T" are occurred in $(Q \wedge (P \to Q)) \to P$ CO1-App

    (a) 4   (b) 3   (c) 1   (d) 2

3. Calculate how many integers between 1 to250 are divisible by 2 or 3   CO2- App

    (a) 41   (b)167   (c) 83   (d) 174

4. The particular integral of $a_n - 4a_{n-1} + 7a_{n-2} = 12$ CO2- App

    (a) 4   (b) 3   (c) 7   (d) 0

5. For a Group $(Z, *)$, * is defined by $a * b = a + b + 1$ then identity element is   CO3- App

    (a) 0   (b)1   (c) -1   (d) 0 and 1

6. The order of the element [2] in a group $(Z_8, \oplus_8)$ CO3- U

    (a) 4   (b) 3   (c) 2   (d) None

7. The value of $\lim_{x \to 1} \dfrac{x^2 - 1}{x - 1}$ CO4- App

    (a) 1   (b) 2   (c) 3   (d) 4

8. $$\int_{2}^{6} \frac{dx}{x}$$

CO4- App

 (a) $\log 4$ (b) $\log 6$ (c) $\log 8$ (d) $\log 3$

9. The value of integral $\int_{0}^{1} \int_{0}^{2} xy^2 \, dy \, dx$

CO5 - App

 (a) $\dfrac{5}{3}$ (b) $\dfrac{1}{3}$ (c) $\dfrac{2}{3}$ (d) $\dfrac{4}{3}$

10. The value of integral $\int_{0}^{1} \int_{0}^{3} \int_{1}^{5} dx \, dy \, dz$ is equal to

CO5- App

 (a) 10   (b) 9   (c) 7   (d) 12

PART – B (5 x 2= 10Marks)

11. Derive R from the premises $P \rightarrow Q$, $Q \rightarrow R$ and P CO1- App

12. Compute the particular solution of the recurrence relation $a_n - 5a_{n-2} = 8n$.   CO2- App

13. Define Ring and give an example.   CO3- App

14. Compute y_2 if $x^2 + y^2 = 4$ CO4- App

15. Change the order of integration $\int_{0}^{a} \int_{y}^{a} f(x, y) \, dx \, dy$ CO5- App

PART – C (5 x 16= 80Marks)

16. (a) (i) Calculate PCNF and PDNF for $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$ CO1-App   (8)

   (ii) Using the rules of inference derive & using CP Rule.   CO1 App   (8)
    $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$, $Q \Rightarrow R \rightarrow S$

<div align="center">Or</div>

  (b) (i) Prove the following by Indirect Method.   CO1 App   (8)
    $P \rightarrow Q$, $Q \rightarrow R$, $\neg(P \wedge R)$, $P \vee R \Rightarrow R$

   (ii) Prove that following Premises inconsistent: CO1 App   (8)
   If Raj misses many classes through illness than he fails high school.
   If Raj fails high school then he is uneducated.
   If Raj reads a lot of books then he is not uneducated.
   Raj misses many classes through illness and reads a lot of books.

17. (a) (i) Using mathematical induction $\qquad$ CO2- App (8)

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots + \frac{1}{n\,(n+1)} = \frac{n}{(n+1)}$$

(ii) Using generating functions Solve $a_n = 2\,a_{n-1} + 3^n$, $a_0 = 1$ $\qquad$ CO2- App (8)

Or

(b) (i) Solve $\qquad$ CO2- App (8)

$$a_n + 3\,a_{n-1} + 2\,a_{n-2} = (6)^n,\ a_0 = 0,\ a_1 = 1$$

(ii) Calculate the number of positive integers not exceeding 850 that are $\qquad$ CO2- App (8)

18. (a) (i) Let G be a finite group of order 'n' and H be any subgroup of G . Then Show that the order of H divides the order of G. (i.e) O(H) / O(G). $\qquad$ CO3- App (10)

(ii) The binary operation * is defined on Q^+ such that $a * b = \dfrac{ab}{3}, a, b \in Q^+$, Show that $(Q^+, *)$ is ab abelian Group. $\qquad$ CO3- App (6)

Or

(b) $S = Q \times Q$, such that binary operation defined by $\qquad$ CO3 App (16)
$(a, b) * (x, y) = (ax, ay + b)$

  (i) Prove that (S, *) is a semi group
  (ii). Is it commutative and calculate the value of (2,4)*(1,5)
  (iii) Find the identity Element
  (iv) Find the inverse of (2,3)*(8,6) and (0,2)*(3,5)

19. (a) (i) Compute $\qquad$ CO4- App (8)

$$\int_0^{\frac{\pi}{2}} \log \cos x\, dx$$

(ii) If $y = e^{ax} \sin bx$ Prove that $\dfrac{d^{2y}}{dx^2} - 2a\,\dfrac{dy}{dx} + (a^2 + b^2)y = 0$ $\qquad$ CO4- App (8)

Or

(b) (i) Compute $\qquad$ CO4- App (8)

$$\int_0^{\frac{\pi}{2}} \frac{dx}{1 + \sqrt{\tan x}}$$

(ii) Evaluate $\qquad$ CO4- App (8)

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$$\lim_{x \to 0} \frac{xe^x - \log(1+x)}{x^2}$$

20. (a)   (i) Compute the volume bounded by the cylinder $x^2 + y^2 = 9$ and   CO5- App   (8)

the planes $z = 0,\ y + z = 4$

(ii) Compute the area between the parabola $y^2 = 9x$ and $x^2 = 9y$ CO5- App   (8)

Or

(b)   (i) Compute   the area between the parabola $y^2 = 4x$ and   CO5- App   (8)
$2x - 3y + 4 = 0$

(ii) Change the order of integration and hence evaluate   CO5- App   (8)

$$\int_{0}^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} xy\,dy\,dx$$