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Question Paper Code: 93027

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

Third Semester

Computer Science and Business System

19UMA327- Discrete Mathematics and Calculus

(Regulation 2019)

Duration: Three hours   Maximum: 100 Marks

Answer All Questions

PART A - (10x 1 = 10 Marks)

1. The symbolic form of "If it is raining, then I get wet" is   CO6-U

   (a) $P \rightarrow \neg Q$ (b) $P \rightarrow Q$ (c) $\neg Q \rightarrow \neg P$ (d) None of these

2. Contra positive of $P \rightarrow Q$ CO6-U

   (a) $\neg Q \rightarrow \neg P$ (b) $\neg P \rightarrow \neg Q$ (c) $Q \rightarrow P$ (d) None of these

3. How many ways can letters of the word "GOOGLE" be arranged   CO2- App

   (a) 40   (b) 150   (c) 160   (d) 180

4. If 'm' Pigeon occupies 'n'(m>n) holes then atleast one hole has more than ----   CO6- U
   Pigeons

   (a) $\left\lceil \dfrac{n-1}{m} \right\rceil$ (b) $\left\lceil \dfrac{m-1}{n} \right\rceil$ (c) $\left\lceil \dfrac{m-1}{n} \right\rceil + 1$ (d) $\left\lceil \dfrac{n-1}{m} \right\rceil + 1$

5. The order of group G= {1,-1,i ,-i } under usual multiplication   CO3- App

   (a) 4   (b)0   (c)1   (d) 2

6. N,+) is a   CO6- U

   (a) Sub group   (b) semi group   (c) group   (d) Moniod

7. Find $\lim\limits_{x \to 1} \dfrac{x^2 - 1}{x - 1}$ CO4- App

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

8. Find the $\dfrac{dy}{dx}$ for $\cos \sqrt{x}$ CO4- App

   (a) $-\sin \sqrt{x}$ (b) $\dfrac{-\sin \sqrt{x}}{2\sqrt{x}}$ (c) $-\cos \sqrt{x}$ (d) $\dfrac{\cos \sqrt{x}}{2\sqrt{x}}$

9. $\iint\limits_{R} dx\,dy$ gives ____   CO6- U

   (a) Volume of R   (b) Area of the region R   (c) Length of R   (d) None of these

10. $\int\limits_{0}^{1}\int\limits_{0}^{2}\int\limits_{0}^{3} dx\,dy\,dz$ is equal to   CO5- App

   (a) 2   (b) 3   (c) 4   (d) 6

<center>PART – B (5 x 2= 10Marks)</center>

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

12. Find the number of positive integers not exceeding 100 that are divisible by 5   CO2- App
    or by 11

13. In an abelian group prove that $(ab)^2 = a^2 b^2$ CO3-App

14. Differentiate $e^{\sin x^2}$ CO4- App

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

<center>PART – C (5 x 16= 80Marks)</center>

16. (a) (i) Prove the following using CP Rule.   CO1- App   (8)

        $P \to (Q \to S), \neg R \vee P, Q \Rightarrow R \to S$

        (ii) Using truth table find PCNF and PDNF for   CO1- App   (8)
        $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$

<center>Or</center>

   (b) (i) Show that the premises "one student in this class knows how to   CO1 - App   (8)
        write programs in JAVA"and "Every one who knows how to
        write programs in JAVA can get a high- paying jop"imply the
        conclusion "some one in this class can get high paying job

        (ii) Prove the following using Indirect method .   CO1 -App   (8)
        $P \to Q, Q \to R, \neg P \vee \neg R, P \vee R \Rightarrow R$

17. (a) (i) Find the number of positive integers between 1 and 600 divisible by 2, 3,5 or 7   CO2 -App   (8)

(ii) Using Mathematical Induction show that, $n^3 + 2n$ is divisible by 3   CO2 -App   (8)

Or

(b) (i) There are seven men and six women in a room. Find the number of ways four persons can be drawn from the room if   CO2 -App   (8)

(a) they can be male or female,

(b) two must be men and two women,

(c) they all are of the same Gender.

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

18. (a) (i) Let G be a finite group of order 'n' and H be any subgroup of G Then the order of H divides the order of G. (i.e) O(H) / O(G)   CO3- App   (8)

(ii) The intersection of two subgroup of a group is also a subgroup of the group   CO3- App   (8)

Or

(b) (i) Prove that in a group G is abelianiff$(a*b)^n = a^n*b^n$ CO3- App   (8)

(ii) Prove that the union of two subgroup of G needs not a sub group   CO3- App   (8)

19. (a) (i) If $y = e^{ax} \cos bx$ Prove that $\dfrac{d^2 y}{dx^2} - 2a\dfrac{dy}{dx} + (a^2 + b^2)y = 0$ CO4-App   (8)

(ii) Determine the reduction formula for $\int \sin^n x\, dx$ CO4-App   (8)

Or

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(b)

(i) Compute $\displaystyle\int_0^{\frac{\pi}{2}} \frac{(\sin x)^{\frac{3}{2}}}{(\cos x)^{\frac{3}{2}} + (\sin x)^{\frac{3}{2}}}\,dx$ CO4 -App (8)

(ii) If $y = (2\cos t - \cos 2t),\ x = (2\sin t - \sin 2t)$ Find the value of $\dfrac{d^2 y}{dx^2}$ CO4 -App (8)

at $t = \left(\dfrac{\Pi}{2}\right)$

20. (a) (i) Using the Triple integration, compute the volume of the CO5- App (8)

tetrahedron $\dfrac{x}{a} + \dfrac{y}{b} + \dfrac{z}{c} = 1$,x=0, y =0 &Z=0

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

$\displaystyle\int_0^a \int_x^a (x^2 + y^2)\,dy\,dx$

Or

(b) (i) Change the order of integration and hence evaluate $\displaystyle\int_0^1 \int_y^{2-y} xy\,dx\,dy$. CO5- App (8)

(ii) Evaluate $\displaystyle\iiint \frac{dx\,dy\,dz}{\sqrt{a^2 - x^2 - y^2 - z^2}}$ over the fitst octant of the CO5- App (8)

sphere

$x^2 + y^2 + z^2 = a^2$

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