## **Question Paper Code: 93027**

## B.E./B.Tech. DEGREE EXAMINATION, MAY 2024

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		Third	Semester			
		Computer Science	and Business System			
		19UMA327- Discrete	Mathematics and Calc	culus		
		(Regula	ation 2019)			
Duration: Three hours				Maximum:	Maximum: 100 Marks	
		Answer A	All Questions			
		PART A - (1	0x 1 = 10 Marks			
1.	The symbolic form of "If it is raining, then I get wet" is				CO6-U	
	$(a) P \to \neg Q$	$(b) P \to Q$	$(c)\neg Q \rightarrow \neg P$	(d) None	of these	
2.	Contra positive of $P \rightarrow Q$				CO6-U	
	$(a) \neg Q \rightarrow \neg P$	$(b) \neg P \rightarrow \neg Q \qquad (c) Q \rightarrow P$		(d) None	(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 Pigeons				CO6- U	
	(a) $\left[\frac{n-1}{m}\right]$	$(b)\left[\frac{m-1}{n}\right]$	$(c)\left[\frac{m-1}{n}\right]+1$	(d) $\left[\frac{n-1}{m}\right]$	-]+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 $\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$				CO4- App	
	(a)1	(b) 2	(c) 3	(d) 4		

8. Find the  $\frac{dy}{dx}$  for  $\cos \sqrt{x}$ (a)  $-\sin \sqrt{x}$ (b)  $\frac{-\sin \sqrt{x}}{2\sqrt{x}}$ (c)  $-\cos \sqrt{x}$ (d)  $\frac{\cos \sqrt{x}}{2\sqrt{x}}$ 

9.  $\iint dx dy \text{ gives} \underline{\hspace{1cm}}$ 

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

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

(a) 2 (b) 3 (c) 4 (d) 6  $PART - B (5 \times 2 = 10 Marks)$ 

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  $(ab)^2 = a^2b^2$  CO3-App

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

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

 $PART - C (5 \times 16 = 80 Marks)$ 

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

 $P \rightarrow \left(Q \rightarrow S\right), \, \neg R \vee P, \, Q \Rightarrow R \rightarrow S$ 

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

Or

(b) (i) Show that the premises "one student in this class knows how to CO1 - App 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)  $P \to Q, Q \to R, \neg P \lor \neg R, P \lor R \Rightarrow R$ 

- 17. (a) (i) Find the number of positive integers between 1 and 600 CO2 -App divisible by 2, 3,5 or 7
  - (ii) Using Mathematical Induction show that,  $n^3 + 2n$  is divisible CO2 -App (8) by 3

Or

- (b) (i) There are seven men and six women in a room. Find the co2 -App (8) number of ways four persons can be drawn from the room if
  - (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 CO3- App

  Then the order of H divides the order of G. (i.e) O(H) / O(G)

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

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 CO3- App (8) group
- 19. (a) (i) If  $y = e^{ax} \cos bx$  Prove that  $\frac{d^2y}{dx^2} 2a \frac{dy}{dx} + (a^2 + b^2)y = 0$  (8)
  - (ii) Determine the reduction formula for  $\int \sin^{-n} x dx$  CO4-App (8)

Or

(b) (i) Compute 
$$\int_{0}^{\frac{\pi}{2}} \frac{(\sin x)^{\frac{3}{2}}}{(\cos x)^{\frac{3}{2}} + (\sin x)^{\frac{3}{2}}} dx$$
 (8)

(ii) If 
$$y = (2 \cos t - \cos 2t)$$
,  $x = (2 \sin t - \sin 2t)$  Find the value of  $\frac{d^2 y}{dx^2}$  CO4 -App at  $t = \left(\frac{\Pi}{2}\right)$ 

- 20. (a) (i) Using the Triple integration, compute the volume of the tetrahedron  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ , x=0, y=0 &Z=0
  - (ii) Change the order of integration and hence evaluate  $\int_{0}^{a} \int_{x}^{a} (x^{2} + y^{2}) dy dx$ (8)

Or

- (b) (i) Change the order of integration and hence evaluate  $\int_{0}^{1} \int_{y}^{2-y} xydxdy$ . CO5- App (8)
  - (ii) Evaluate  $\int \int \int \frac{dxdydz}{\sqrt{a^2 x^2 y^2 z^2}}$  over the fitst octant of the sphere  $\mathbf{x}^2 + \mathbf{y}^2 + \mathbf{z}^2 = \mathbf{a}^2$