23NM426N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BVoc DEGREE EXAMINATION MAY 2025
(Fourth Semester)

Branch - NETWORKING & MOBILE APPLICATION

MATHEMATICAL STRUCTURES

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Find the determinant of the matrix $A = \begin{bmatrix} 2 & 5 & -1 \\ 0 & 10 & 5 \\ 0 & 0 & 5 \end{bmatrix}$ a) 17 b) 100 c) 20 d) 5	K1	CO1
	2	Find the rank of the matrix $A = \begin{bmatrix} 0 & 15 & 5 \\ 0 & 3 & 1 \\ 0 & 0 & 5 \end{bmatrix}$ a) 0 b) 2 c) 3 d) 1	K1	CO1
2	3	The process of computing inter mediate values of a function from a given set of tabular values of the function is called----- a) Interpolation b) Extrapolation c) Differentiation d) Integration	K2	CO2
	4	The formula used for interpolating a value of y close to end of table values is----- a) Newton Forward interpolation b) Newton backward interpolation c) Lagrange's interpolation d) Numerical Integration	K2	CO2
3	5	The "Simpson" sum is based on the area under a ----- a) parabola b) hyperbola c) straight line d) scalar	K2	CO3
	6	When Simpson's rule is used to approximate the definite integral, it is necessary that the number of partitions be----- a) even b) odd c) multiple of 4 d) any value	K2	CO3
4	7	The amount of time that a task can be delayed without affecting the completion date of the project is known as---- a)Total Float b) Free float c) Independent Float d) Mean Float	K2	CO4
	8	The path of a least total float in a project is --- a)Activity b) Event c) PERT d) Critical Path	K2	CO4

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5	9	Arrivals at a telephone both are considered to be Poisson at an average time of 8 min between our arrival and the next. The length of the phone call is distributed exponentially, with a mean of 4 min. Determine Expected fraction of the day that the phone will be in use? a)0.1 b) 0.2 c)0.5 d) 1/10	K1	CO5
	10	Which distribution is used in service time? a) Exponential distribution. b) Gamma distribution c) Poisson distribution d) Logarithmic distribution	K1	CO5

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Find the rank of the matrix $\begin{pmatrix} 1 & 2 & 1 \\ -2 & -3 & 1 \\ 3 & 5 & 0 \end{pmatrix}$.	K2	CO1
		(OR)		
	11.b.	Find the product of the matrix $\begin{pmatrix} 3 & 2 \\ 1 & 4 \end{pmatrix}\begin{pmatrix} 3 & 2 \\ 1 & 4 \\ 5 & 3 \end{pmatrix}$.		
2	12.a.	Evaluate $y(1985)$ using Newton's forward formula for the data given below. x: 1981 1901 1911 1921 1931 y: 46 66 81 93 101	K3	CO2
		(OR)		
	12.b.	Find the cubic polynomial which takes the following values: x: 0 1 2 3 y: 1 2 1 10		
3	13.a.	Given that x: 1.0 1.1 1.2 1.3 1.4 1.5 1.6 Y: 7.989 8.403 8.781 9.129 9.451 9.750 10.031 Find the value of $\frac{dy}{dx}$ at x = 1.1	K3	CO3
		(OR)		
	13.b.	Evaluate $\int_0^3 \frac{1}{1+x^3} dx$ using Simpson's rule.		
4	14.a.	**Define** (a)Total float (b)Free float (c)Independent float of activities in CPM and give their interpretations.	K4	CO4
		(OR)		
	14.b.	(i) Construct the network for the project whose activities and their precedence relationships are given below: Activity :P Q R S T U Predecessor:_ _ _ P,Q P,R Q,R		

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5	15.a.	In a self service store with one cashier, 8 customers arrive on an average of every 5 mins. and the cashier can serve 10 in 5 mins. If both arrival and service time are exponentially distributed, then determine a) Average number of customer waiting in the queue for average. b) Expected waiting time in the queue c) What is the probability of having more than 6 customers In the system.	K4	CO5
		(OR)		
	15.b.	A T.V repairman repair the sets in the order in which they arrive and expects that the time required to repair a set has an ED with mean 30mins. The sets arrive in a Poisson fashion at an average rate of 10/8 hrs a day. (a) What is the expected idle time / day for the repairman? (b) How many TV sets will be there, waiting for the repair?		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Find the inverse of the matrix $\begin{pmatrix} 2 & 3 & 4 \\ -3 & -3 & -2 \\ -2 & 1 & -1 \end{pmatrix}$.	K2	CO1
2	17	The table gives the distance (y) in nautical miles of the visible horizon for the given heights (x) in feet above the earth's surface: x: 100, 150, 200, 250, 300, 350, 400 y: 10.63, 13.03, 15.04, 16.81, 18.42, 19.90, 21.27 Find the values of y when (i) x = 160 ft. (ii) x = 410.	K3	CO2
3	18	Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ using (i) Simpson's rule and Find the approximate value of π.	K3	CO3
4	19	Construct the Critical path for the following project Activity: 1-2, 2-3, 3-4, 3-7, 4-5, 4-7, 5-6, 6-7 Duration: 3, 4, 4, 4, 2, 2, 3, 2	K4	CO4
5	20	At a stamp vender window of a post office 20 customers arrive on an average every 10 min. the vender clerk can serve 5 customers in 2 min. Determine a)Average number of customer in the System b)Average waiting time of a customer c)Probability of a customer waiting more than 3mins before being served d) Idle time of the vender clerk in a shift of 8hrs	K4	CO5

Z-Z-Z END