25STP104/22STP104N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch - **STATISTICS**

APPLIED OPERATIONS RESEARCH

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	The Dual Simplex method is generally used when: a) All constraints are satisfied but optimality is violated b) All constraints are violated but optimality is satisfied c) Both constraints and optimality are violated d) None of the above	K1	CO1
	2	In Integer Programming Problems, "Pure Integer Programming" refers to: a) All decision variables must take integer values b) Only some decision variables take integer values c) Decision variables take fractional values d) Variables can be integer or continuous	K2	CO1
2	3	The Economic Order Quantity (EOQ) model without shortage assumes: a) Stock-outs are allowed b) Demand is uncertain c) Shortage cost is zero d) Stock-outs are not allowed	K1	CO2
	4	ABC Analysis in inventory control classifies items based on: a) Supplier location b) Unit price only c) Annual consumption value d) Storage cost	K2	CO2
3	5	In the notation (M/M/1), the second "M" refers to: a) Memoryless service time distribution b) Multiple servers c) Maximum waiting time d) Mean arrival rate	K1	CO3
	6	In an (M/M/1):(∞/FCFS) queue, "FCFS" stands for: a) First Case First Served b) First Come First Served c) Fixed Capacity for Service d) Finite Customers Finite Service	K2	CO3
4	7	In PERT, the expected time (TE) for an activity is calculated using: a) a+m+b/3 b) a+4m+b/6 c) a+m+b/6 d) 4a+m+b/6	K1	CO4
	8	Crashing in project management refers to: a) Reducing project scope b) Reducing project duration by adding resources c) Increasing slack time d) Removing dummy activities	K2	CO4
5	9	Kuhn–Tucker conditions are used for: a) Linear programming problems b) Problems with equality constraints only c) Nonlinear programming problems with inequality constraints d) Simulation models	K1	CO5
	10	In Goal Programming, the main objective is: a) To maximize a single profit function b) To minimize costs only c) To achieve multiple goals simultaneously d) To solve quadratic equations	K2	CO5

Cont...

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.	Explain the steps of the Dual Simplex Method with an example.	K3	CO1
		(OR)		
	11.b.	Solve using Dual Simplex Method: Maximize $Z=3x+2y$ subject to $x+y \geq 4$, $x+2y \geq 6$, $x, y \geq 0$		
2	12.a.	Derive the formula for EOQ (no shortage).	K2	CO2
		(OR)		
	12.b.	Given D = 1200 units/year, S = ₹60/order, H = ₹3/unit/year. Find EOQ.		
3	13.a.	Define performance measures of a queuing system.	K2	CO3
		(OR)		
	13.b.	Arrival rate $\lambda = 4$/hr, service rate $\mu = 6$/hr. Find average number of customers in the system.		
4	14.a.	Explain the PERT expected time formula.	K2	CO4
		(OR)		
	14.b.	Discuss about the cost and Time Analysis (crashing).		
5	15.a.	State the Kuhn–Tucker conditions for nonlinear programming.	K2	CO5
		(OR)		
	15.b.	Write a short note on Goal Programming.		

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	Solve the following Linear Programming Problem using the Dual Simplex Method: Maximize $Z=3x_1+2x_2$ Subject to $2x_1+x_2 \geq 6$ $x_1+3x_2 \geq 9$ $x_1, x_2 \geq 0$	K3	CO1
2	17	A company uses 5,000 units of a product per year at ₹10 per unit. Ordering cost = ₹40 per order, carrying cost = 10% per annum. Find: a) EOQ b) Number of orders per year c) Total annual cost	K3	CO2
3	18	In a service centre, customers arrive at an average rate of 10 per hour and are served at an average rate of 15 per hour. Find: a) Average number of customers in the system (L_s) b) Average number waiting (Lq) c) Average time in system (W_s) d) Average waiting time in queue (Wq)	K3	CO3
4	19	Explain the Monte Carlo Simulation Method for project scheduling.	K2	CO4
5	20	Explain the difference between Quadratic Programming and Linear Programming.	K2	CO5

Z-Z-Z END