QP CODE: 23127057

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, OCTOBER 2023

Third Semester

B.Sc Mathematics Model II Computer Science

COMPLEMENTARY COURSE - MM3CMT02 - MATHEMATICS - OPERATIONS RESEARCH - QUEUEING THEORY

2017 Admission Onwards

28FAC797

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Define a Play.
2. State Minmax Theorem.
3. Define the term Mixed Strategy.
4. Explain Strategic saddle point with an example.
5. Define the term Event.
6. Define Independent Float.
7. What can you understand when total float is Zero?
8. How can you identify a critical path in a network diagram?
9. Name any three Queue Discipline.
10. Define queue size.
11. Write Distribution of Service Times.
12. Write the formula Probability that the queue is non-empty.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Solve the payoff matrices $\begin{bmatrix} 1 & -2 \\ -5 & 1 \end{bmatrix}$

14. Solve graphically $\begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 1 \end{bmatrix}$

15. An assembly is to be made from two parts X and Y.Both parts must be turned on a lathe and Y must be polished whereas X need not be polished.
The sequence of activities together withh their predecessors i given below.

Activity	Description	Predecessor Activity
A	Open work order	-
B	Get material for X	A
C	Get material for Y	A
D	Turn X on lathe	B
E	Turn Y on lathe	B,C
F	Polish Y	E
G	Asseble X and Y	D,E
H	Pack	G

Draw a network diagram of activities for the project.

16. Delhi Medical association is considering to hold a conference.The following table gives the list of activities involved,their immediate predecessors and their duration

Activity	Description	Predecessors	Duration(days)
A	Design conference meetings and theme	-	3
B	Design front cover of the conference proceedings	A	2
C	Prepare brochure and send request for papers	A	6
D	Compile list of distinguished speakers/guests	A	3
E	Finalize brochure and print it	C,D	7
F	Make travel arrangements for speakers/guests	D	4
G	Des patch brochures	E	3
H	Receive papers for conference	G	25
I	Edit papers and assemble proceedings	F,G	10
J	Print proceedings	B,I	20

1. Prepare a network diagram showing the interrelationships of the various activities.
2. Find the total time required to hold the conference.
3.Compute the total float for the non-critical activities.

17. Explain Backward Pass Method.

18. An architect has been awarded a contract to prepare a plans for an urban renewal project.The job consists of
the following activities and estimated times.

Activity	Description	Duration(Weeks)	Predecessors
A	Prepare preliminary sketches	2	-
B	Outline specifications	1	-
C	Prepare drawings	3	A
D	Write specifications	2	A,B
E	Run off prints	1	C,D
F	Have specifications	3	B,D
G	Assemble bid packages	1	E,F

1. Draw the network diagram of activities for the project
2. Indicate the critical path,calculate the total float and free float for each activity.

19. Write a short note on Calling Populations

20. Consider a self-service store with one cashier. Assume Poisson arrivals and exponential service times. Suppose that nine customers arrive on the average every 5 minutes and the cashier can serve 10 in 5 minutes. Find
    1. average number of customers queuing for service
    2. probability of having more than 10 customers in the system, and
    3. probability that a customer has to queue for more than 2 minutes.

    If the service can be speed up to 12 in 5 minutes by using a different cash register, what will be the effect on the quantities (a), (b) and (c).

21. At what average rate must a clerk at a super market work in order to ensure a probability of 0.90 so that the customer will not wait longer that 12 minutes? It is assumed that there is only one counter at which customers arrive in a Poisson fashion at at average rate of 15 per hour. The length of service by the clerk has an exponential distribution.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. Write both the primal and the dual LP problems corresponding to the rectangular games with the following payoff matrices.

    Solve the game by the LP problem by simplex method $\begin{bmatrix} 1 & -1 & 3 \\ 3 & 5 & -3 \\ 6 & 2 & -2 \end{bmatrix}$

23. The following network diagram represents activities associated with a project Determine the following

Activity	Predecessor activity	Time estimates in weeks		
		Optimistic	Most likely	Pessimistic
A	-	5	10	8
B	-	18	22	20
C	-	26	40	33
D	A	16	20	18
E	A	15	25	20
F	B	6	12	9
G	C	7	12	10
H	D	7	9	8
I	F,E	3	5	4

1. Expected activity time and variance .
2. The earliest and latest expected completion of each event.
3. The probability of expected completion time of the project if the original scheduled time of completing the project is 41.5 weeks.
4. The duration of the project that will have 95 percent chance of being completed.

24. A small project consists of seven activities,the details are given below:

Activity	Predecessor activity	Time estimates in days		
		Most likely	Optimistic	Pessimistic
A	-	3	1	7
B	A	6	2	14
C	A	3	3	3
D	B,C	10	4	22
E	B	7	3	15
F	D,E	5	2	14
G	D	4	4	4

1. Draw the network,number the nodes,find the critical path,the expected completion time and the next most critical path.
2. What project duration will have 95 percent confidence of completion.

25. In a bank cheque are cashed at a single 'teller' counter. Customers arrive at the counter ina Poisson manner at an average rate of 30 customers per hour.The teller takes, on an average, a minute and a half to cash cheque. The service time has been shown to be exponentially distributed.

1.Calculate the percentage of time the teller is busy.

2.Calculate the average time a customer is expected to wait.

(2×15=30)