21101971

QP CODE: 21101971

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS)EXAMINATION, AUGUST 2021

Third Semester

B.Sc Mathematics Model II Computer Science

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

2017 Admission Onwards

B9687E03

Time: 3 Hours

Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Define a Play.
2. Explain Saddle Point of a Matrix.
3. Define the term Pure Strategy.
4. Examine the payoff matrices for saddle points. In case the saddle point exists, find the optimal strategies and value of the game. $\begin{bmatrix} 2 & -1 & -2 \\ 1 & 0 & 1 \\ -2 & -1 & 2 \end{bmatrix}$
5. Write the difference between Merge and Burst Event.
6. Define free float.
7. What can you understand when total float is positive?
8. How can you identify a critical path in a network diagram ?
9. Define traffic intensity.
10. Write the formula for expected number of customers in the system.
11. Write the formula for expected number of customers in the queue.
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. Explain Matrix (Or Rectangular) Games with an example.

14. Solve graphically $\begin{bmatrix} 2 & 7 \\ 3 & 5 \\ 11 & 2 \end{bmatrix}$

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. A research and development department is developing a new power supply for a console television set.It has broken the job into the following

Job	Description	Immediate Predecessors	Duration(days)
A	Determine output voltages	-	5
B	Determine whether to use solid state rectifiers	A	7
C	Choose rectifiers	B	2
D	Choose filters	B	3
E	Choose transformer	C	1
F	Choose chassis	D	2
G	Choose rectifier mounting	C	1
H	Layout chassis	E,F	3
I	Build and test	G,H	10

1.Draw the network diagram of activities involved in the project and indicate the critical path.
2. What is the minimum completion time for the project?

17. Write a short note on Critical Path Analysis

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. Define a Queue

20. Which distributions are used to approximate arrival time distributions

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. A promoter is organizing a sports meeting.The relationship among the activities and time estimates in days are shown below in the table.

Activity	Activity Description	Predecessors	Activity time in days		
			Optimistic	Most likely	Pessimistic
A	Prepare draft programme	-	3	7	11
B	Send to sports organizations and wait for comments	A	14	21	28
C	Obtain promoters	A	11	14	17
D	Prepare and sign documents for stadium hire	A,C	2	2	2
E	Redraft programme and request entries	B	2	3.5	8
F	Enlist officials	D,E	10	14	21
G	Arrange accommodation for touring teams	E	3	4	5
H	Prepare detailed programme	E,F	4	4.5	8
I	Make last minute arrangements	G,H	1	2	4

1. Draw the network diagram for the project and complete expected completion time of the project.
2. What should be the due date to have 0.90 probability of project completion?
3. Find the total float and free float for all non-critical activities
4. What is the probability that the length of the critical path does not exceed 56 days?

23. Write both the primal and dual problem corresponding to the rectangular games with the following payoff matrices.

Solve the game by solving the LP problem by simplex method. $\begin{bmatrix} 0 & 1 & 2 \\ 2 & 0 & 1 \\ 1 & 2 & 0 \end{bmatrix}$

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. The mean rate of arrival of planes at an airport during the peak period is 20 per hour, and the actual number of arrivals in any hour follows a Poisson distribution. The airport can land 60 planes per hour on an average in good weather and 10 planes per hour in bad weather, but the actual number landing in any hour follows a Poisson distribution
with these respective averages. When there is congestion, the planes are forced to fly over the field in the stack awaiting the landing of other planes that arrived earlier.
1.How many planes would be flying over the field in the stack on an average in good weather and in bad weather?
2.How long would a plane be in the stack and in the process landing in good and in bad weather?

(2×15=30)