

Total No. of Questions – [03]

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Paper Code	U 321 - 264 (BE)
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MAY 2022 ENDSEM EXAM
T.Y. B.Tech. (MECHANICAL) (SEMESTER - II)
COURSE NAME: OPERATION RESEARCH
COURSE CODE: ES32184ME
(PATTERN 2018)

Time: [1 Hr]

[Max. Marks: 30]

Instructions to candidates:

- 1) Figures to the right indicate full marks
- 2) Use of scientific calculator is allowed
- 3) Use suitable data wherever required

- Q.1** a) PNG Jewellers uses a diamond cutting machine of cost ₹ 100000, and its scrap value is ₹ 20000. The maintenance costs found from the experience are as follows: [4]

Year	1	2	3	4	5	6
Maintenance cost	10000	20000	30000	40000	50000	60000

When should the diamond cutting machine be replaced?

- b) A computer company sells a personal computer which cost Rs 25000. It costs the store Rs.5000 each time it places an order with the manufacturer. The annual carrying cost is Rs. 1000. The manager estimates the annual demand of PC's to be 1000 units. Evaluate economical order quantity per year and the total optimum cost per year. [6]

OR

- b) Madras Rubber Factory (MRF) manufactures certain type Tyres in batches. [6]
The estimated demand is 30 units per day. It costs Rs. 1,00,000 to setup the manufacturing process and the carrying cost is Rs. 5,000 per unit per year. Once the production process has been setup, 50 units can be manufactured daily. How long will the manufacturing cycle last?

- Q.2** a) Students of VIIT arrives at student section according to a Poisson distribution with mean of 20 minutes. Clerk spends an amount of time per student is exponential with mean of 10 minutes. There are three chairs Infront of the clerk including the serviced one. Other students must wait outside the cabin. Calculate the probability that an arrival will get a chair to sit down. [4]
- b) Students of VIIT arrives at Account section according to a Poisson distribution with mean of 20 minutes. Account clerk spends an amount of time per student is exponentially distributed with mean of 10 minutes. There is only one counter and clerk can entertain only one student at a time, remaining student must wait [6]

in queue. Accounts department decided to reduce the students waiting time in the queue from 10 minutes to 5 minutes, find the new approximate average service time by account clerk.

OR

b) There are six jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are given as [6]

Jobs	J1	J2	J3	J4	J5	J6
M/C A	16	20	25	14	27	12
M/C B	17	26	21	18	24	23

Determine a sequence of these jobs that will minimize the total elapsed time T. Also find idle time for machines A and B.

Q.3 a) Draw the Network diagram based on the following data: [4]

Activity	Immediate Predecessors
A	-
B	A
C	A
D	A
E	B
F	C
G	D
H	E,F,G

b) Draw the Network diagram for the given activities of the project. Find the critical path and evaluate latest start and finish Time for all activities. [6]

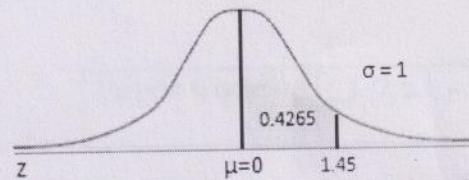
Activity	Immediate Predecessors	Duration
A	-	2
B	-	8
C	A	8
D	B	9
E	C,D	12
F	C,D	4
G	E	6
H	F	5

OR

b) The time estimate (in days) for the activities of a PERT network are given below. [6]
If the project due date is 34 days, find the probability of meeting the due date?

Activity	Time (Optimistic)	Time (Most likely)	Time (Pessimistic)
1 - 2	6	9	12
2 - 3	14	17	20
2 - 4	7	10	13
2 - 5	12	15	18
3 - 5	2	5	14
4 - 5	3	6	15
5 - 6	1	10	19

For example, when Z score = 1.45
the area = 0.4265.



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000