

**Birla Institute of Technology & Science, Pilani || KK Birla Goa Campus**  
**First Semester 2022-2023**

**Mid-Semester Examination (Closed Book)**

ME F316 Manufacturing Management

Date: 03/11/2022

Time: (2:00 PM -3:30 PM)

MM 50 (Weight 30%)

Note:

1. All questions carry equal marks. Each answer should start from a fresh page.
2. You may make suitable assumptions, if and wherever necessary and state them clearly.

1. An oil company has recently acquired rights in certain area to conduct surveys and test drilling to lead to installing extraction unit where oil is found in commercially exploitable quantities. At the outset, the company has the choice to conduct further geological tests or to carry out drilling programme immediately. On the known conditions, the company estimates that there is 65:35 chances of further tests showing a “success”.

Even if no tests are undertaken at all, the company could still pursue its drilling programme. Likelihood of final success or failure is considered dependent on the foregoing stages as below:

- (i) If tests indicate success, the expectation of success in drilling is given as 75:25.
- (ii) If tests indicate failure, then the expectation of success in drilling is given as 25:75.
- (iii) If no tests have been conducted at all, the expectation of success in drilling is given as 55:45.

Company can also sell the exploitation rights at different costs under each situation. Costs and revenues have been estimated for all possible outcomes and the net payment value of each is given below:

Outcome	Net present value (Rs. Millions)
Success with prior test	105
Success without prior tests	125
Failure with prior test	-55
Failure without prior tests	-45
Sale of exploitation rights with prior test showing success	60
Sale of exploitation rights with prior test showing failure	15
Sale of exploitation rights with no prior test	45

Draw a decision tree diagram and advise the best course of action.

2. A hospital is evaluating two machines for analyzing blood samples. One unit is more expensive than the other, but has lower labor cost. Both machines meet the hospital’s needs. The interest rate is 10 percent. Using the net present value method, which unit should the hospital purchase?

	Unit 1	Unit 2
Purchase cost	\$15000	\$22000
Economic life	3 years	3 years
Labor cost per year	\$14000	\$9000
Salvage Value after 3 year	\$3000	\$3000
Installation cost	\$4000	\$5000
Maintenance cost		
First year	\$500	\$1000
Increase per year	\$100	\$500

3. A list of activities and their optimistic, most likely and pessimistic completion time estimates (all in days) for a new contract are given in the following table:
  - a. Determine the expected completion time and variance for each activity.
  - b. Determine the total project completion time and the critical path for the project.
  - c. What is the probability that the project will be finished in 40 days or less.

Activity	Time (in days)			Precedence
	A	M	B	
A	3	6	8	--
B	2	4	4	--
C	1	2	3	--
D	6	7	8	C
E	2	4	6	B,D
F	6	10	14	A,E
G	1	2	4	A,E
H	3	6	9	F
I	10	11	12	G
J	14	16	20	C
K	2	8	10	H,I

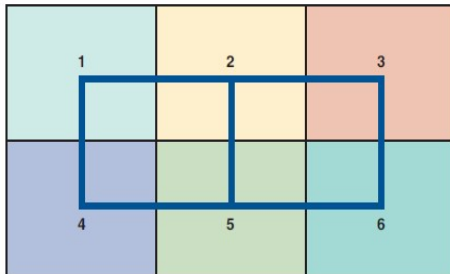
4. The pre-induction physical examination given by Indian Army involves the following seven activities:

ACTIVITY	AVERAGE TIME (min)
Checking medical history	10
Blood tests	8
Eye examination	5
Measurements (e.g. weight, height, blood pressure)	7
Medical examination	16
Psychological interview	12
Exit medical evaluation	10

These activities can be performed in any order, with two exceptions: Medical history must be taken first, and Exit medical evaluation is last. At present, there are three paramedics and two physicians on duty during each shift. Only physicians can perform exit evaluations and conduct psychological interviews. Other activities can be carried out by either physicians or paramedics.

- Develop a layout and balance the line. Determine, how many people can be processed per hour?
- What is the total idle time per cycle?

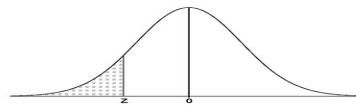
5. A machine shop, is planning to move to a new, larger location. The building is envisioned to have six distinct production areas, roughly equal in size as shown below. He feels strongly about safety and intends to have marked pathways throughout the building to facilitate the movement of people and materials and there is no crossed movement permitted. His foreman has completed a month-long study of the number of loads of material that have moved from one process to another in the current building and this information is contained in the following flow matrix. Suggest an efficient layout for the machine shop.



Flow Matrix Between Production Processes

TO \ FROM	MATERIALS	WELDING	DRILLS	LATHES	GRINDERS	BENDERS
Materials	0	100	50	0	0	50
Welding	25	0	0	50	0	0
Drills	25	0	0	0	50	0
Lathes	0	25	0	0	20	0
Grinders	50	0	100	0	0	0
Benders	10	0	20	0	0	0

Cumulative Standard Normal Distribution Table



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-0.00	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
-0.10	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.20	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.30	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.40	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.50	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.60	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.70	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.80	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.90	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-1.00	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-1.10	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.20	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.30	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.40	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.50	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.60	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.70	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.80	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.90	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-2.00	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-2.10	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.20	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.30	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.40	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.50	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.60	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.70	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.80	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.90	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-3.00	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-3.10	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.20	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.30	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.40	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.50	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
-3.60	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.70	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.80	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

\*Note: z-values less than -3.89 produce a probability of zero.

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