B.Prod. Engg. 4th Year 1st Semester Examination – 2024

Ref. No.: Ex/PROD/PC/B/T/413/2024

Subject: **Plant and Maintenance Engineering**

Time: 3 Hours Marks: 100

Answer any five questions

1. a) Show how transportation model can effectively be used as a tool for solving plant location problem through an example known to you. 15

b) Outline its limitation based on the above example. 5

2. a) Expound KAIZEN umbrella. 5

b) Elucidate techno economic life of plant and equipment with examples. 15

3. An engineering asset has a first cost of Rs.8000 and an estimated salvage value of Rs.1000 at the end of 4 years. The interest rate is 12%.

Tabulate capital recovery, return and capital recovery plus return for each year by the i) straight line method ii) sinking fund model of depreciation and iii) reducing balance method of depreciation. Make a comparative analysis among the three models graphically. 20

4. a) Table-I shows the number of failures in the time interval obtained from a set of experimental data from testing certain units.

Table I: Failure Data

Life (Hrs)	No of failures
0-10	91
10-20	45
20-30	26
30-40	16
40-50	10
50-60	7
60-70	5
70-80	3
80-90	2
Over 90	25

i) Calculate the failure rate estimate for each interval and plot on the graph paper. 5

ii) Calculate the reliability estimates and plot them on the graph paper. 5

iii) What is the type of failure characteristics exhibited by these units? 5

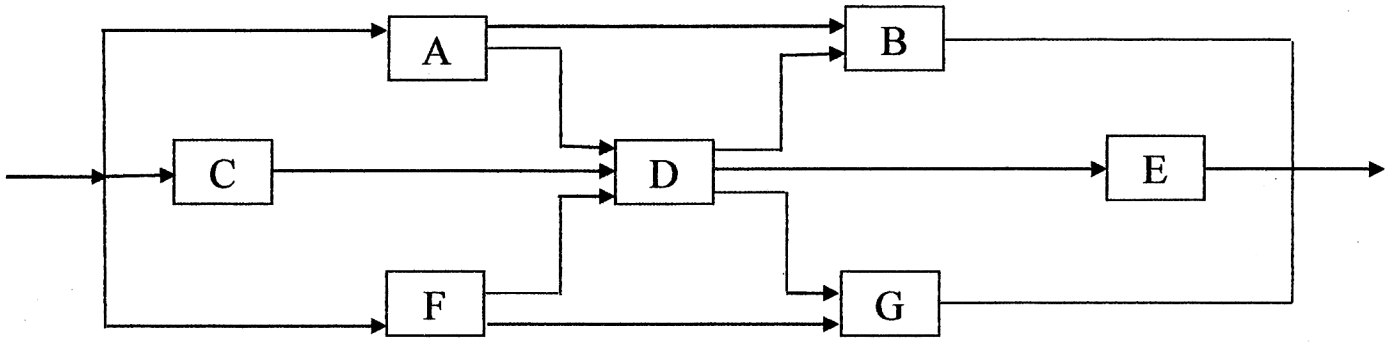
b) Explicate 3-parameter Weibull distribution. 5

[Turn over

5. a) What is total productive maintenance(TPM)? Explain. 15

b) What is marginal reliability? 5

6. Evaluate the reliability of the system shown below:



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7. An organization has 30 machines to keep in service. The breakdown repair cost is Rs. 900 per machine. Preventive maintenance at a cost of Rs. 200 per machine can reduce breakdowns. Experience reveals that the probability of a machine breaking down is as follows:

Months until breakdown	1	2	3	4	5	6	7
Probability of breakdown	0.10	0.05	0.10	0.20	0.25	0.15	0.15

a) What is the expected breakdown cost per month? 6

b) If preventive maintenance is followed, how often should the machines be serviced? 14

8. Write short notes on any four:

a) PDCA cycle

b) Material Index

c) Balance delay

d) Partial redundant system

e) Agglomerating factors

f) Reliability Block Diagram (RBD)

5×4=20