

**PROJECT ENGINEERING
(CHEN 4231)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) What is the primary role of a project engineer in a chemical plant?
 - (a) Design and construction
 - (b) Operations and maintenance
 - (c) Planning and execution
 - (d) Research and development
- (ii) What is the purpose of a plant layout?
 - (a) To reduce the size of the plant
 - (b) To increase the production capacity
 - (c) To improve the safety of the plant
 - (d) To reduce the cost of construction
- (iii) What is the purpose of plant utilities?
 - (a) To provide power and water to the plant
 - (b) To provide transportation and logistics services to the plant
 - (c) To provide communication and IT services to the plant
 - (d) To provide security and safety services to the plant
- (iv) Identify the method which cannot be used as profitability evaluation for replacements
 - (a) Payback period
 - (b) Pareto Analysis
 - (c) Discounted Cash flow
 - (d) Net return
- (v) Identify the correct statement on depreciation
 - (a) The total depreciable amount depends on the depreciation method
 - (b) Depreciation concept gives protection from income tax
 - (c) The equipment mandatorily discarded when its asset value is zero
 - (d) ACRS is preferred to MACRS
- (vi) Breakeven analysis is used to determine the:
 - (a) Minimum investment required for a project
 - (b) Maximum profit that can be earned from a project
 - (c) Point at which the total revenue equals the total cost
 - (d) Optimum production level for a project

- (vii) Optimum economic pipe diameter for fluid is determined by
 (a) Viscosity of the fluid
 (b) Density of the fluid
 (c) Total cost considerations (pumping cost + fixed cost of the pipe)
 (d) None of the above
- (viii) PERT Network is invented by
 (a) Diamond Alkali Co. (b) Du Pont International
 (c) US Navy (d) Tata Sons Ltd
- (ix) Identify the sequence which is allowed in Network planning
 (a) Loop formation (b) Dummy activities
 (c) Mutual crossing of activity arrows (d) Repetition of node numbers
- (x) Fulkerson's rule is associated with
 (a) Numbering network (b) Integer programming
 (c) Transportation problem (d) Assignment problem

Fill in the blanks with the correct word

- (xi) The method of calculation of depreciation which incorporates time value of money is_____.
- (xii) The present worth of a future amount is calculated by _____.
- (xiii) The beginning and end of the project is defined by the project _____.
- (xiv) Breakeven analysis is a technique used to evaluate the _____ of a project.
- (xv) The SEZ located in Kolkata is _____.

Group - B

2. (a) Define the objectives of project management team. [[CO1](Analyse/HOCQ)]
 (b) Show that the capitalized cost of an asset can be expressed as

$$K_v = C_v + \frac{C_R}{e^{in}-1}$$
 If the interest is compounded continuously, where, K_v = capitalized cost, C_v =original cost, C_R = replacement cost i = annual interest rate, n = service life year.
[[CO2](Apply/IOCQ)]
4 + 8 = 12
3. (a) Assume a person has the opportunity to receive an ordinary annuity that pays \$70,00 per year for the next 23 years, with a 9% discount rate, or take a \$ 650000 lumpsum payment. Find the present value annuity and present value annuity due. Also state that the better option with justification. [[CO1](Analyse/HOCQ)]
 (b) A company invests ₹1,00,000 for 5 years at a simple interest rate of 8% per annum. Calculate the interest earned and the maturity value of the investment.
[[CO1](Apply/IOCQ)]
8 + 4 = 12

Group - C

4. (a) What is Straight-line Depreciation method? What are its advantages? [[CO2](Remember/LOCQ)]
(b) A piece of equipment having a salvage value Rs40,000 is estimated to have a service life of 10 years. The original cost of the equipment was 4,00,000. Determine the depreciation charge for the fourth year if straight line depreciation is used. [[CO2](Evaluate/HOCQ)]
(2 + 4) + 6 = 12
5. (a) What is Text-book declining Balance Depreciation method? What are its advantages? [[CO2](Remember/LOCQ)]
(b) Deduce the fixed percentage (f) formula using original value (V), Salvage value (V_s) and service life (n). [[CO2](Evaluate/HOCQ)]
(c) Draw a plot of Asset value (V_a) versus life period in years using Text-book declining Balance, Double declining Balance and combination method. [[CO2](Apply/IOCQ)]
(2 + 2) + 4 + 4 = 12

Group - D

6. (a) Explain the basic principle of optimum design in project engineering. How does it differ from traditional design approaches? [[CO3](Analyse/HOCQ)]
(b) Describe the comparison between graphical and analytical method of optimization. [[CO3](Remember/LOCQ)]
6 + 6 = 12
7. (a) Enumerate the factors associated with minimum cost analysis of a Chemical Plant. [[CO3](Remember/LOCQ)]
(b) A plant produces Heating Mantles at the rate of P units per day. The variable costs per unit have been established to be Rs $(47.73 + 0.1.P^{1.2})$. The total daily fixed charges are Rs 1800, and all other expenses are constant at Rs 7325 per day. If the selling price per Heating Mantle is Rs 173, determine the daily profit at a production schedule giving the minimum cost per mantle. [[CO3](Evaluate/HOCQ)]
6 + 6 = 12

Group - E

8. (a) State and explain Fulkerson's Rule for numbering a network diagram. [[CO4](Analyse/IOCQ)]
(b) Discuss with the help of a plot the characteristics of the β - distribution for PERT network. [[CO4](Remember/LOCQ)]
(2 + 4) + 6 = 12

9. (a) Draw a PERT network diagram of the following project:

Activity	Immediate Predecessor(s)	Duration (weeks)		
		t_o	t_L	t_p
A		7	16	28
B	A	4	19	25
C	A	10	16	37
D	B	7	13	37
E	B,C	13	19	33
F	B	19	22	33
G	D,E	4	7	19
H	F,G	13	19	49
I	B,C	13	25	37
J	I,H	7	13	19

[[CO4](Analyse/IOCQ)]

- (b) Calculate the variance of individual activities and hence calculate the total variance of the project.

[[CO4](Evaluate/HOCQ)]

$$6 + 6 = 12$$

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	29.17	29.17	41.66