

**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) The method of calculation of depreciation which incorporates time value of money is
(a) Declining Balance Method (b) Sum of the Years Digit Method
(c) Straight Line Method (d) Sinking Fund Method
- (ii) Asset value of a property
(a) is the worth of the property in the market
(b) is the worth of the property as shown in the owner's accounting records
(c) is independent of time
(d) cannot be predicted, without experimental determination
- (iii) The CPM network is
(a) A deterministic network
(b) A probabilistic network
(c) A virtual network
(d) Sometimes deterministic & sometimes probabillistic
- (iv) The β – distribution is
(a) a discrete distribution (b) a synonym of normal distribution
(c) a skewed distribution (d) virtual distribution
- (v) The PERT network is
(a) A deterministic network
(b) A probabilistic network
(c) A virtual network
(d) Sometimes deterministic & sometimes probalistic
- (vi) Which stage of project management life cycle requires the maximum time of completion?
(a) Conceptualization (b) Planning
(c) Execution (d) Estimation

- (vii) Which one of the following is captured in the Work Breakdown Structure (WBS)?
 (a) The life cycle phases (b) The logical order of tasks
 (c) The scope of the project (d) Project costs
- (viii) Which of the following is not a feature of a project?
 (a) Constrained by limited resources (b) Planned, executed and controlled
 (c) Creates unique product or service (d) May be ongoing and repetitive
- (ix) MACRS incorporates
 (a) Calculation related to GDP (b) Half Year Convention
 (c) Profitability (d) All of these
- (x) Identify the standard related to Safety and Health Aspects of a project
 (a) ISO 9000 (b) SA 8000
 (c) OHSAS 18000 (d) ISO 14000

Fill in the blanks with the correct word

- (xi) The 95% confidence interval means _____ % level of significance.
- (xii) The methodology of numbering of Network is known as _____ rule.
- (xiii) The provision for Half year convention is there in _____ system.
- (xiv) The particular task performance in CPM is known _____.
- (xv) Which of the following is the most important element of Project Management Plan that is useful in HR Planning process _____.

Group - B

2. (a) Describe the unique skills required to become a project manager. What are the exemptions given to the industry under SEZ scheme? [[CO1] (Understand/LOQC)]
 (b) Define present value of annuity. Describe the difference between annuity and annuity due. [[CO1] (Understand/LOCQ)]
- (2 + 3) + 7 = 12**
3. (a) Enumerate Four Safety Measures to be incorporated in a Chemical Project. [[CO1](Remember/LOCQ)]
 (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](Evaluate/HOCQ)]
- 4 + 8 = 12**

Group - C

4. (a) A piece of equipment having a salvage value Rs 30,000 is estimated to have a service life of 10 years. The original cost of the equipment was 3,00,000. Determine the depreciation charge for the fourth year if straight line depreciation is used. [[CO2](Evaluate/HOCQ)]

- (b) Determine the depreciation charge for the fifth year for the same set of conditions if 200% method-depreciation is used. [[CO2](Evaluate/HOCQ)]
- (c) Enumerate the two methods of profitability analysis. [[CO2](Remember/LOCQ)]
- 5 + 5 + 2 = 12**
5. (a) Discuss in brief the importance of Gross Domestic Product index and National Growth. [[CO2](Analyse/IOCQ)]
- (b) A plant is producing 10,000t/y of a product. The overall yield is 70% on a mass basis (kg of product per kg raw material). The raw material costs Rs. 1,200/t, and the product sells for Rs. 4,000/t. A process modification has been devised that will increase the yield to 75%. The additional investment required is Rs. 35,00,000, and the additional operating costs are negligible. Is the modification worth-making? [[CO3](Evaluate/HOCQ)]
- 4 + 8 = 12**

Group - D

6. (a) Determination of optimum values with two independent variables. The following equation shows the effect of the variables x and y on the total cost for a particular operation:
- $$C_T = 2.33x + \frac{11900}{xy} + 1.86y + 10$$
- Determine the values of x and y which will give the least total cost. [[CO3](Evaluate/HOCQ)]
- (b) A manufacturer of hand drills sells a drill for Rs 2000.
 The various annual expenses are as follows:
 Material Cost: Rs 50000
 Labour Cost: Rs 25000
 Cost of motor for each drill: Rs 1000
 The factory over head: 40% of prime cost
 Total office expenses: 10% of factory cost
 Calculate the profit on each drill if annual production is 5000 units [[CO3](Evaluate/HOCQ)]
- 7 + 5 = 12**
7. (a) An organic chemical is being produced by a batch operation in which no product is obtained until the batch is finished. Each cycle consists of the operating time necessary to complete the reaction plus a total time of 1.4 h for discharging and charging. The operating time per cycle is equal to $1.5P_b^{0.25}h$, where P_b is the kilograms of product produced per batch. The operating costs during the operating period are \$20 per hour, and the costs during the discharge charge period are \$15 per hour. The annual fixed costs for the equipment vary with the size of the batch as follows: $C_p = 340P_b^{0.8}$ dollars per batch. Inventory and storage charges may be neglected. If necessary, the plant can be operated 24 h per day for 300 days per year. The annual production is 1 million kg of product. At this capacity, raw-material and miscellaneous costs, other than those already mentioned, amount to \$260,000 per year. Determine the cycle time for conditions of minimum total cost per year. [[CO3](Understand/HOCQ)]

- (b) Describe the optimum condition in cyclic operation involve in periodic shutdowns for discharging, cleanout, or reactivation. [[CO3](Apply/IOCQ)]

8 + 4 = 12

Group - E

8. The following activities for a symposium with their duration in days are given below: Fixing the dates (2); Formulate the theme (2); collect the contact details for sending brochure (4); get the brochure printed (6); finalize selection of two guest speakers (1); send invitation to the two guest speakers (1); mail brochure to all (3); collect all submitted papers (45); Review and finalize papers (10); inform the authors of the acceptance (7); arrange accommodation and refreshment (6); arrange transportation (2); arrange lecture halls, PA systems etc. (2); prepare introductory speech (1); assign duties to volunteers (2)

With these pre-arrangements, let us assume the symposium can begin.

- (i) Draw the Network.
- (ii) Determine the minimum number of days required for preparatory work before the actual symposium can begin.
- (iii) Determine the critical path for the network. [[CO4](Evaluate/HOCQ)]

(4 + 4 + 4) = 12

9. (a) Discuss the difference between PERT and CPM network. [[CO4](Remember/LOCQ)]
 (b) State the development of Network techniques from Gantt Chart. [[CO4](Analyse/IOCQ)]
 (c) Loop formation should be avoided for drawing Network-- Explain. [[CO4](Analyse/IOCQ)]

4 + 6 + 2 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	22.92	16.66	60.42

Course Outcome (CO):

After the completion of the course students will be able to

1. Understand the basics of project engineering and apply that to organize the activities of project engineering for economic analysis of the project.
2. Apply cost and profitability analysis for the project under considerations and study the preliminary feasibility of the project.
3. Implement innovative ideas to optimization of the plant design components in regard to requirement of energy, time and ultimately cost.
4. Perform network analysis of the project and critically examine the schedule for the completion and cost impacts for the project.

**LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.*