

**BACHELOR OF CONSTRUCTION ENGINEERING FOURTH YEAR EXAMINATION,
2024**

Computer Aided Construction Management

Full marks: 100

(Basic Elective II)

Time: 3 hours

Section -A

Answer any 7 (seven) questions

1. (a) What do you mean by stakeholders of a construction project? If you are working on a project of construction of road bridge over a perennial river, who are the likely stakeholders? 1+3
- (b) When errors in calculating IRR may arise in MS Excel? 2
- (c) What are the limitations of IRR technique? 4
2. (a) Give examples of production, procurement and management activities (2 each) in connection with a water supply project in a major city. 4
- (b) Regarding the projects having long gestation periods, what is the likely outcome of NPV and IRR calculations? 2
- (c) What are the activities to be taken up during 'site-survey' stage of a major highway project? 4
3. (a) Explain 'start to start' and 'finish to finish' dependencies used in network diagram with suitable examples from construction projects. 4
- (b) What are the limitations of cost-slope method in time-cost-trade off? 4
- (c) What is dummy activity used in network diagram? 2
4. (a) What are the activities to ensure project control? 4
- (b) What do you mean by 'forward pass' and 'backward pass' in a network diagram? Why are they necessary? 3+1
- (c) Does early payment from client improve the cash flow position of the contractor? Explain your answer. 2
5. On the basis of the given data, draw a schedule following precedence diagramming method and find: 7+1
+2
 - (i) Time of completion of the project
 - (ii) Critical activities

ID	Activity	Duration (days)	Dependencies
1	A	7	-
2	B	3	-
3	C	3	-

[Turn over

4	D	8	A, B[FF+3days]
5	E	7	A, B[SS-1day]
6	F	1	B, D[SS+1day]
7	G	9	C, 5[SF]
8	H	7	D, G

6. Activities of a project and its optimistic, most probable and pessimistic times are given below:

Activity	Optimistic time (days)	Most probable time (days)	Pessimistic time (days)
A	5	9	12
B	2	5	6
C	4	6	8
D	4	11	16
E	1	2	2.4
F	5	9	10
G	4	7	10
H	8	9	10

- (a) If there are 3 paths to complete the project as A-C-E-G, B-D-E-H and D-F-G, then find project completion time (T_E) and its standard deviation. 6
- (b) What is the probability of completion of the project at a duration equal to or more than T_E ? 1
- (c) Explain how central limit theorem has been used in the above calculations. 3
7. (a) What is the difference between abstract estimate and detailed estimate? 3
- (b) Material needs to be sent from 3 factories (A, B & C) to 3 sites (S1, S2 & S3). Material can be sent from any of the factory to any of the sites. Cost of transportation of per kg of material from each factory to each site in INR is given below: 2+1 +4

Factory/site	S1	S2	S3
A	25	16	12
B	18	23	13
C	10	17	26

- Quantity that can be sent from factory A, B & C to all the sites together is 300, 260 and 200 kg respectively
- Quantity demanded by site S1, S2 and S3 are 180, 80 and 200 kg respectively which needs to be met by A, B and C.

The objective is to determine the quantities to be shipped from each factory to each site so that the overall cost of transportation remains minimum. If the same is to be calculated by optimization exercise through MS Excel,

- (i) Define the variables
- (ii) Mention the objective function in mathematical terms
- (iii) Enumerate the constraints in mathematical terms

8. (a) Two schedule alternatives of a construction project with associate resource profile are shown in the table below:

Profile 1	Weeks	0-4	4-8	8-12	12-16	16-20
	Resource requirement	4	9	9	6	2
Profile 2	Weeks	0-4	4-8	8-12	12-16	16-20
	Resource requirement	4	5	8	8	3

Based on method of moments (M_x), which profile would you choose and why? 5

(b) If both M_x and M_y are calculated, would you like to change your earlier inference? 5

Section -B

Answer any 3 (three) questions

9. Write short notes on 'digital twins' and '3D printing' in construction. 5+5
10. (a) What are the three common features of BIM which have been highlighted by different definitions? Explain in detail. 6
- (b) What is WGS 84 system? Where is it used? 3+1
11. (a) What are the challenges faced in implementing BIM in existing structures? 4
- (b) What are the advantages of using cloud for data storage? Why is it essential for construction projects? 4+2
12. (a) What are the limitations of aerial survey by UAV (drone)? 4
- (b) Name one software popularly used for the following purpose: 4
- (i) Structural analysis and design
 - (ii) Geo-technical analysis
 - (iii) Project scheduling
 - (iv) Project portfolio management
- (c) Name 4 types of sensors used for structural health monitoring. 2