

Seat Number

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चरक - 001

ELECTIVE - I
Highway, Projects Planning, Designing &
Economic Evaluation
(1051)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any five** questions.

1. a) Explain the necessity and objective of highway planning in India. 10
b) Explain importance of transport planning. State and explain different planning surveys. 10
2. a) State different types of traffic surveys and explain any three in detail. 10
b) What are the various requirements of an ideal highway alignment? Discuss briefly. 10
3. Explain summit and valley curve and various cases when these are formed while two different gradients meet. Discuss the problem in highway valley curves and the best shape of valley curve. 20
4. a) Discuss how the problem of road construction in water logged areas may be solved. 10
b) Derive an expression for finding the stopping sight distance at level and at grades. 10

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5. a) Compare and contrast between Flexible Pavement and Rigid Pavement in detail on various points. 10
- b) Explain group index method of pavement design in detail. What are the limitations of this method? 10
6. a) Calculate the stresses at interior, edge and corner regions of cement concrete pavement using Westergaard's stress equation. Use following data 12
 Wheel Load, $P=41100\text{kg}$.
 Modulus of elasticity of cement concrete, $E=3.0 \times 10^5\text{kg/cm}^2$
 Pavement thickness, $h=15\text{cm}$.
 Poisson's ratio of concrete, $\mu=0.15$
 Modulus of subgrade reaction, $K=3.0\text{ Kg/cm}^2$
 Radius of contact area, $a=15\text{cm}$
- b) Discuss the importance of highway economy studies. 8
7. a) Explain briefly various factors affecting the vehicle operation cost. 10
- b) Discuss the internal and external stability of reinforced earth structures. 10
8. Write a short note on following **any four**. 20
- i) Jaykar committee.
- ii) Highway safety.
- iii) Road transport taxation system.
- iv) Central Road Fund.
- v) Innovative highway construction material.

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चरक - 005

ELECTIVE - II
Resource Management
(1102)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any five** questions.
5. Figures to right indicate full marks.
6. Use of pocket calculator is allowed.
7. Assume suitable data if required.

1. a) What are the objectives of material management ? 6
- b) Discuss the role of material manager in material management. 6
- c) What are the advantages in integrated material management concept ? 8
2. a) "ABC Analysis indicates selective control of inventories" Discuss. 8
- b) The finance department of an organization provides the following information: 12
 - i) The carrying costs per unit of inventory are Rs. 10/-
 - ii) The fixed costs per order are Rs. 20/-
 - iii) The number of units required is 30,000 per year.Determine the EOQ, total number of orders in a year and the time gap between two orders.

3. a) Define "Safety stock". How it is determined ? What is the role of safety stock in inventory management ? 8
- b) What is "Stock out" ? Explain the trade off between stock out and carrying costs of inventory. 12
4. a) What does "just in Time" (JIT) signify ? How far is JIT concept possible to apply under Indian condition ? 12
- b) State briefly the steps in the procedure of 'ABC' classification. 8
5. a) Discuss the importance of training in the context of job redesign. 8
- b) Explain the goals and task of HRD department. 12
6. a) What is the role of HRM ? What are the various challenges faced by HRM ? 12
- b) Explain the needs of Human Resource Planning in any organization. 8
7. Explain the following with examples. 20
 - i) Material management system in materials planning.
 - ii) Inventory control.
 - iii) Supplier evaluation method.
 - iv) Competency development.

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चरक - 007

Construction Planning, Scheduling & Management (1010)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

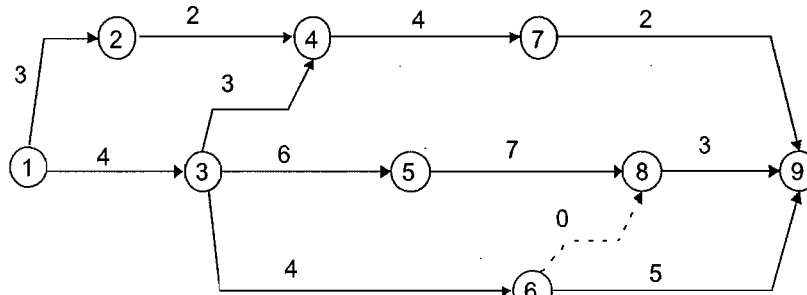
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any five** questions.
5. Use of Z table is permitted.

1. a) Define most optimistic, most pessimistic & most likely times used in probability analysis. How is the expected time calculated from them? Define the formula. Also define standard deviations & variance. 10
b) Differentiate techniques of resources analysis. What purposes do it serves? Give example. 10
2. a) Discuss 10
i) bar chart
ii) fine of balance technique
b) Describe the method of updating the project. Why to update the project? 10
3. a) From give time estimates determine 15
i) Critical path & standard deviation;
ii) Probability of completion of project in 39 & 30 days;
iii) Time duration that will provide 95% probability of its completion in time.

Activity	1-2	2-3	2-4	2-5	3-4	3-7	4-6	5-6	6-7	7-8
t_o (optimistic)	2	8	4	4	0	3	7	3	2	2
t_m (most likely)	5	11	7	9	0	5	10	7	3	4
t_p (pessimistic)	8	20	16	18	0	13	12	17	10	6

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- b) Compare CPM & PERT techniques. 5
4. a) Calculate four types of floats from given network. Find critical path. 15



- b) Define all four floats & write their formulae 5
5. From given data compress the network if indirect cost of project is ₹ 3000/- per week. Find the optimal duration & corresponding cost of project plot cost curve. 20

Activity	Normal Duration (Weeks)	Normal cost ₹	Crash Duration (wks)	Crash cost ₹
1-2	6	7000 /-	3	14,500 /-
1-3	8	4000 /-	5	8500 /-
2-3	4	6000 /-	1	9000 /-
2-4	5	8000 /-	3	15000 /-
3-4	5	5000 /-	3	16000 /-

6. a) Write importance of job layout. Justify the locations of following units in the good job layout 10
- i) Site office ;
 - ii) Canteen,
 - iii) Materials store
- b) What are the project success & failure criterias? Define role of a project manager. 10
7. a) Discuss resource smoothing & resource leveling. Give example. 10
- b) Write a note on W. B. S. Describe rules of preparing WBS. Give an example. 10

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Environmental & Energy Management (1090)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any five** questions.
5. Illustrate your answers with suitable sketches.
6. Answers should be written in same answer book.

- | | | |
|----|--|----|
| 1. | a) Discuss the concept of Environment & Environmental impact. | 10 |
| | b) State & explain the environmental impact factors for infrastructure project such as Airports. | 10 |
| 2. | a) What do you understand by the concept of significant effect. | 10 |
| | b) Discuss irreversible and irretrievable commitments of resources. | 10 |
| 3. | a) Differentiate between short term & long term effects. | 10 |
| | b) Explain physical, social, aesthetic & economic environment. | 10 |
| 4. | a) What are the salient features of electricity Act – 2003. | 10 |
| | b) Elaborate on UNFCC. | 10 |
| 5. | a) What are the rules, regulations and laws Governing energy conservation in India & developed nations ? | 10 |
| | b) What are the Natural / physical Environmental impacts ? | 10 |

- | | |
|--|----|
| 6. a) What are the benefits of carbon credits and its trading to developing Countries. | 10 |
| b) Discuss conference of parties. | 10 |
| 7. a) How is the evaluation of energy efficient projects done ? | 10 |
| b) What are the various ways of financing the energy efficient projects ? | 10 |
| 8. a) State & explain the types of energy performance contracts. | 10 |
| b) What are energy service companies and discuss their role in energy efficient projects ? | 10 |

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Contracts Administration & Arbitration (1020)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any five** questions.
5. Assume suitable data if necessary.

- | | | |
|----|---|----|
| 1. | a) What are tenders ? State different tender documents. Explain global tenders and BOT systems. | 10 |
| | b) Write the Indian contract act. | 10 |
| 2. | a) Explain issues related to tending process, Awarding contract incentives and penalties in specifications. | 10 |
| | b) Write essentials of valid contract. | 10 |
| 3. | a) Explain Breach of contract. | 10 |
| | b) Explain contracts for projects under International AID. | 10 |
| 4. | a) Explain industrial Act and labour laws. | 10 |
| | b) Explain Indian trade union act. | 10 |
| 5. | a) Explain main features of Indian Arbitration Act. | 10 |
| | b) Explain rules of evidence preparation and publication of awards. | 10 |

6. a) Explain an limitation of arbitration in the Indian context. 10
- b) Explain necessity formation functioning advantages administration of incentive schemes. 10
7. Write short notes on **any four**. 20
- i) Pay fixation according to minimum wages act.
 - ii) Ment rating.
 - iii) Qualities of arbitrator.
 - iv) Tribunals.
 - v) Job evaluation.
 - vi) Functioning of dispute resolving boards.

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Advance Concrete Technology (1080)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any five** questions.

1. a) Explain the effects of super plasticizers on fresh concrete. 5
 b) State and explain factors affecting the workability of concrete. 10
 c) State some of the practical site problems in the use of super plasticizers. 5
2. a) Explain corrosion of reinforcement and its control in details. 10
 b) What is carbonation of concrete? State the factors affecting the rate of Carbonation. 10
3. a) What are the different methods for proportioning mix design and explain DOE method of concrete mix design. 10
 b) State and explain the four variables factors to be considered in connection with specifying a concrete mix design. 10
4. a) Write a note on 10
 1) light weight concrete
 2) autoclaved aerated concrete
 b) What do you understand by fiber reinforced concrete? State and explain factors affecting properties of fiber reinforced concrete. 10

5. a) What do you understand by Read Mix concrete? What is mixing efficiency? State & explain limitations of Ready Mix concrete. 10

Explain

- b) 1) Concrete coating and surface treatment 10
2) Underwater concrete.

6. a) What do you understand by "formwork for exposed concrete finishes"? What is the criteria for load on formwork. 10

- b) What are the various types of precast concrete products? What are its advantages? 10

7. Explain the following 20

- 1) Mass concrete
2) Slipform construction
3) Pumped concrete
4) Concrete Roads (Methods and material for pavement)

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चरक - 011

Life Cycle Costing of Infrastructures (1030)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
 2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
 3. Students should note, no supplement will be provided.
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1. What is LCC ? What are its benefits and limitations ? Explain any 3 methods of performing LCC of an infrastructure project. 20
 2. Compare rigid pavements as against the flexible pavements based on their life cycle costing approach considering their total performance during the concession period. 20
 3. Explain the following types of costs with examples. 20
 - i) Direct and Indirect.
 - ii) Onetime and time dependent.
 - iii) Normal and Crash.
 - iv) Recurring and Non – recurring.
 - v) Initial and LCC.
 4. Compare and contrast between ARR and IRR as regards their usefulness for LCC of a nuclear power plant designed for a life of 75 years, which technique is more suitable for this type of a project ? Justify. 20

5. Determine PBP and the $NPV_{(12)}$ for the following cash flows. Also determine the modified payback period for 12% discount rate. 20

Year	Cash Inflow (Rs)	Cash Out flow (Rs)
0	-	30,00,000
1	-	40,00,000
2	25,00,000	10,00,000
3	35,00,000	-
4	15,00,000	-
5	10,00,000	-
6	5,00,000	-

Is the above investment worthwhile ? Justify.

6. Explain use of simulation, scenario analysis, sensitivity analysis and fuzzy logic methods in risks investigation of infrastructure projects being executed under the public private partnerships (PPP) in India. 20
7. Explain in brief the following. 20
- Project Cost – influence diagram.
 - Adjusted (IRR)
 - Equivalent annual cost analysis.
 - Advantages of mathematical models use in LCC.
 - Effect of Inflation on cash flows.

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चरक - 012

Safety Management in Construction (1070)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
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3. Students should note, no supplement will be provided.
4. Solve **any five** questions.

1. Prepare notes on- 20
 - a) Ladder Safety.
 - b) Blasting Safety.
 - c) Supervisory safety function by site supervisor.
 - d) Personal protective equipment (P.P.E.)
2. a) Prepare a safety training program for on – site induction for Graduate Trainees appointed to work on a dam project. 10
b) Define accident what are the root causes of accidents ? Provide solutions to those causes. 10
3. a) What is the role of varies parties of project in project in project site safety ? Describe integrated approach to site safety 'Highlight importance of coordination amongst stakeholders' in achieving safety. 10
b) Describe the role of safety officer in various stages of a project. 10

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4. a) What are various barriers in achieving safety at site ? List ways to monitor & improve safety culture on site. 10
- b) What are different types of safety audits ? Describe in detail. 10
 - i) Health & safety management audit
 - ii) Product safety audit.
5. a) Prepare safety checklist for concreting of slab on 35th floor. Include check lift for scaffold & formwork as well. 10
- b) Write a note on safety measurement. How to achieve safety from falling objects at site ? 10
6. Write notes on. 20
 - a) Safety of hoists.
 - b) Organization chart of safety department for marine project work. Explain roles of each.
 - c) Need of safety training.
 - d) Benefits of safety.
7. a) What are the qualities of good construction safety manager ? Discuss safety management in construction industry. 10
- b) Write a note on safety economics & legal aspects of safety. 10

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Construction Methods & Equipment Management (1060)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

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2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any five** questions.
5. Draw neat sketches wherever necessary.
6. Assume suitable data wherever necessary.

- | | | |
|----|---|----|
| 1. | a) Explain sinking of wells with neat sketch. | 10 |
| | b) Explain with sketch Tunnel Forms. | 10 |
| 2. | a) Explain with sketch, Dragline. | 10 |
| | b) Explain Hoe with its components & operation. | 10 |
| 3. | a) Explain with sketch, Transit Mixer for RMC transport. | 10 |
| | b) State various types of Rollers & explain any one in detail. | 10 |
| 4. | a) Explain Travelling Tower crane with neat sketch. | 10 |
| | b) State different types of pile driving hammers & explain any one in detail. | 10 |
| 5. | a) Explain single stages well point system with sketch. | 10 |
| | b) Explain RMC plant with its layout. | 10 |

6. a) Explain in detail concrete Pumps. 10
b) Explain equipment depreciation cost & methods of computing it. 10
7. a) Write about factors affecting choice of construction Equipment. 10
b) Explain equipment owning & operating cost. 10
8. Write short notes **any four**. 20
- i) Belt conveyors
 - ii) Precast concrete
 - iii) Dozer blades
 - iv) Equipment maintenance & repair.
 - v) Work cycle output.
 - vi) Downtime cost of equipment.

Seat Number

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चरक - 013

Irrigation Water Distribution Systems (1040)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any five** question.

1. Explain canal regulation works? Describe the necessity and functioning of a "Distributary head regulator" and "Cross regulator" in a canal project. Also discuss the design of these regulation works. 20
2. a) Differentiate between contour border and contour check methods of irrigation? Give their design criteria. 10
b) Discuss the advantages of using pre-fabricated RCC canal outlets for canal minors, course & field channels. 10
3. Discuss the main causes of failure of weirs founded on previous foundation. Also explain the important theories for designing such weirs to avoid the failure due to the above causes. 20
4. a) Discuss the basic factors influencing the design of an underground pipeline irrigation system. 10
b) Explain the common troubles observed in the functioning of underground pipeline system? How are they overcome? 10

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5. a) Draw a typical cross section of a canal in partly cutting and partly filling giving the design aspect. 10
- b) Calculate the balancing depth for a canal of bed width 20mt. & side slope of 1:1 in cutting & 2:1.5 in filling. The bank embankment are kept 2.5 mt higher than ground level & crest width of bank are kept as 1.5 mt. 10
6. a) Explain the difference between basin & ring method of Irrigation. Draw the layout of ring irrigation. State the condition under which basin & rings are constructed. 10
- b) With neat sketch explain different components of weir & barrages. 10
7. a) What is inverted siphon & why it is necessary? Draw the plan and elevation of inverted siphon. 10
- b) What is canal escape? State the function served by it & its ideal location. Discuss sluice & weir escape with neat sketch. 10
8. Write short note on following ALL. 20
- a) USBR Type proportional division box.
- b) Weir as discharge measuring structure
- c) Gibb's rigid module.
- d) Berms and counter berms.
