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## RPSC Main Exam 2019 : Test Series

### Assistant Engineer

#### Social Aspects of Engineering

### Compulsory Subject : Paper-II

**Test No. 10** | Date of Exam. : 01-09-2019 (9 AM to 12 Noon)

#### Part-A

1. Marginal Standing Facility (MSF) is very short term borrowing scheme for scheduled banks and is rate at which scheduled banks borrow funds overnight from RBI against government securities.
2. Fair and Remunerative Price (FRP) is the minimum price at which rate sugarcane is to be purchased by sugar mills from farmers.
3. Bharat Net will bridge rural-urban divide by provide Internet connectivity in local bodies in every Panchayat.
4. Halo effect is the assumption that because the person is good at a technology/technical skills, then he will be a good project manager. It describes an error in thinking in which you make an inference about a person.
5. The Internal Rate of Return (IRR) also known as Economic Rate of Return (ERR) is a method of calculating rate of return. The term internal means that the calculation does not incorporate environmental factors (i.e., interest rate or inflation). It is also called the Discounted Cash Flow Rate of Return (DCFRROR), sometimes it is also known as effective interest rate.
6. Currency chest is the place where the currency is stored. These chests act as the distributives of RBI cash and enable RBI to take back soiled notes and mutilated notes from the public.
7. Terrestrial Solar Radiation is a solar radiation that pass through the earth's atmosphere and subjected to scattering and atmospheric absorption.

8. The revised cumulative target of Jawaharlal Nehru National Solar Mission is 1,00,000 MW of solar power by 2022. The target will principally comprise of 40 GW Rooftop and 60 GW through Large and Medium Scale Grid Connected Solar Power Projects.
9. Biomass Briquetting is the densification of loose biomass into high density solid fuel. It reduces the volume-to-weight ratio, thus making transportation easy for efficient commercial and industrial work.
10. Gratuity is a kind of benefit like the provident fund or pension. It is regarded as a legitimate claim which workmen can make and which in a proper case can give rise to an industrial dispute. It is a reward for good, efficient and faithful service rendered for a fairly substantial period and it is not paid to the employee gratuitously or merely as a matter of bonus but for long and meritorious award.
11. Adjudication means a mandatory settlement of an industrial dispute by a Labour court or a tribunal. Generally, the government refers a dispute for adjudication depending on the failure of conciliation proceedings.
12. Collective bargaining is a negotiation between an employer or group of employers and a group of working people to reach an agreement on working conditions.
13. Third generation Biofuels are specifically engineered crops such as algae as the energy source. These are grown and harvested to extract oil from them.
14. The Montreux Record is a register of wetland sites on the List of Wetlands of International Importance where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference.
15. Scrubbers are used to clean air for both dusts and gases by passing it through a dry or wet packing material.
16. Flash flood is characterized by very fast rise and recession of flow of small volume and high discharge, which causes high damages because of suddenness.
17. Worker means a person who is employed directly or through any agency including contractor with or without the knowledge of principal employer.
18. **The Industrial Dispute Act 1947 defines retrenchment as** the termination by the employer, of the service of the workman, for any reason, whatsoever, otherwise than as a punishment inflicted by way of disciplinary action but does not include voluntary retirement, compulsory retirement of the workman on reaching the age of superannuation or termination of service on the grounds of continued ill health.
19. Grievance denotes any discontent or dissatisfaction, whether expressed or not and whether valid or not, arising out of anything, connected with the company that an employee thinks, believes or even feels, is unfair, unjust or inequitable.
20. The Acronym SMART refers to Simple, Moral, Accountable, Responsive, Responsible and Transparent Government.

**Part-B****21. Natural causes of Floods in India:**

**Heavy rainfall:** Heavy rain in the catchment area of a river causes water to over flow its banks, which results in the flooding of nearby areas.

**Sediment deposition:** River beds become shallow due to sedimentation. The water carrying capacity of such river is reduced. As a result, the heavy rainwater over flow the river banks.

**Cyclone:** Cyclone generated sea waves of abnormal height spreads the water in the adjoining coastal areas. In October 1994 Orissa cyclone generated severe floods and caused unprecedented loss of life and property.

**Change in the course of the river:** Meanders, erosion of river beds and banks, and obstruction of flow due to landslides also lead to changes in river courses.

**Tsunami:** Large coastal areas are flooded by rising sea water, when a tsunami strikes the coast.

**Lack of Lakes:** Lakes can store the excess water and regulate the flow of water. When lakes become smaller, their ability to regulate the flow become less and hence flooding.

**22.** External Commercial Borrowing (ECB) is instrument used in India to facilitate Indian companies to raise money outside the country in foreign currency. It may be commercial loans which can be in form of bank loans, bonds, securitized instruments, buyers' and supplier's credit availed from non-resident lenders with minimum average maturity of 3 years.

In India, ECBs availed of by residents are governed by Foreign Exchange Management Act (FEMA), 1999 along with Foreign Exchange Management (Borrowing or Lending in Foreign Exchange) Regulations, 2000, as amended from time to time.

**23.** Cloud seeding is a type of weather modification that aims to change the amount or type of precipitation that falls from clouds by dispersing substances into the air that serve as cloud condensation or ice nuclei, which alter the microphysical processes within the cloud.

The most common chemicals used for cloud seeding include silver iodide, potassium iodide and dry ice (solid carbon dioxide). Liquid propane, which expands into a gas, has also been used. This can produce ice crystals at higher temperatures than silver iodide.

**24.** Technology Transfer is the process of transferring skills, knowledge technologies, methods of manufacturing, samples of manufacturing and facilities among governments or universities and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services.

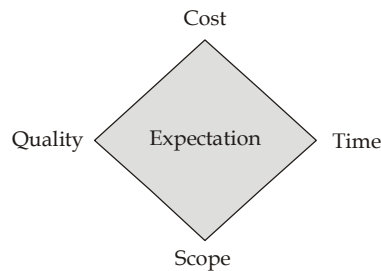
**25. Impacts of Acid Rain:**

- **Impact on Biota and Human Life:** The Acid Rains show adverse impact on the forests, freshwaters, soil and aquatic life forms. The acid rain eliminates the insect life in the lakes and ponds. It kills the soil organisms and thus changes the soil chemistry.
- **Impact on Soil Chemistry:** In the soil, there is an adverse impact on the nutrients such as Magnesium. This is because, Calcium and Magnesium are leached away by the Hydronium ion of the acids.

- **Impact on Buildings:** Acid rain is capable of damaging the buildings and historic monuments which are made up of rocks such as limestone and marble. This is because these rocks contain a large amount of Calcium Carbonate, which reacts with the Sulphuric Acid to create Gypsum.

26. **The Diamond Constraint:** The Project management diamond constraint include cost, quality, time and scope.

1. **Time:** Time is very crucial to any project. Alteration of Project completion time changes the cost.
2. **Scope:** Scope tells what needs to be achieved and the work that must be done to deliver a project.
3. **Cost:** Cost is the monetary value of a Project. Cost is directly dependent on time and scope and the quality to be produced.
4. **Quality:** This is the standard of something as measured against other things of a similar kind, the degree of excellence of something.



Here the change in any constraint will affect the other in order to maintain the expectation diamond. A constraint limits the execution of project or process.

27. SWOT analysis:

S - Strength

W - Weakness

O - Opportunity

T - Threat

This is a good technique which considers internal and external factors and helps in Project Identification.

	Positive	Negative
Internal factors	<b>Strength (S)</b> 1. Technical know how within 2. Established organisation and structure 3. Collaborations	<b>Weakness (W)</b> 1. Lack of skilled persons. 2. Lack of Proper Technology 3. Lack of Funds
External factors	<b>Opportunity (O)</b> 1. Government support 2. New Technology strategic alliance	<b>Threats (T)</b> 1. Price Fluctuation 2. Market condition 3. Political meat

A project which utilises the positive aspects like strength and opportunity is identified and a project with negative aspect like weakness and threats is dropped.

**28. Advantages of Payback Period:**

1. Easy and simple to calculate.
2. It can be used to measure risk in project.
3. For companies facing liquidity problems, it provides a good ranking of projects that would return money early.

**Disadvantages of Payback Period:**

1. It does not take into account the time value of money. To remove this drawback, discounted cash flow method can be used.
2. It does not take into account the cash flows that occur after payback period.

**29.** Green computing or IT sustainability is the study and practice of environmentally sustainable IT or computing. This can include designing, manufacturing, using, and disposing of computers, servers, and associated subsystems efficiently and effectively with minimal or no impact on the environment. Besides IT itself being green, it can support, assist, and leverage other environmental initiatives to achieve energy efficiency and reduce carbon footprint in every walk of life by offering innovative solutions. In addition to moving itself in a greener direction and leveraging other environmental initiatives, ICT could also help create green awareness by assisting in building communities, engaging groups and supporting education and green advocacy campaigns.

**30.** Rajasthan State Agency for Computer Services (RajCOMP) is a department under government of Rajasthan. It was established as consultancy and project implementation agency in 1989, to cater to the increasing Scope of application of IT in the Government Sector. RajCOMP's day-to-day working is managed by the Managing Director. The Chief Secretary heads the governing Board of RajCOMP and the Secretary, IT & C chairs the executive body. About 50 programmers and analysts from DoIT&C have been deputed in various departments to spearhead the computerization and e-Governance initiatives of the department. Therefore, most of the departments have been able to develop in house applications. Some other departments have undertaken computerization initiatives with the help of RajComp.

**31.** When coal is burnt (e.g. in coal fed power plants), two types of ash is produced. One that falls in the bottom of the boiler is called bottom ash. Another is made of fine particles that are driven out along with the flue gases. These fine particles are captured using the electrostatic precipitators or some other filtration equipments when the flue gases reach at Chimney of the plant. This is called Fly Ash and is made of Silica, Aluminium oxide, calcium oxide and some potentially toxic elements such as arsenic, beryllium, cadmium, barium, chromium, copper, lead, mercury, molybdenum, nickel, radium, selenium, thorium, uranium, vanadium, and zinc etc.

**Uses of Fly Ash:**

- Fly Ash was once discarded as a waste but today, it is increasingly emerging as a major input material in several industries including cement, agriculture, construction, Paints etc.
- Fly Ash is added as a mixture to cement for building construction, laying of roads and landfills.
- The bricks and blocks made of fly-ash are stronger and cheaper than conventional bricks Fly ash can help transform barren wasteland into lush green forests
- Pigments extracted from Fly Ash can be very useful in manufacturing of paints.

32. e-RaktKosh solution streamlines the standard operating procedures, guidelines and workflow of blood banks in accordance to NACO and NABH guidelines. C-DAC carried out integration of e-RaktKosh with National Health Portal of India and UMANG Mobile App. Currently, more than 1,700 blood banks in the country have on-boarded the system. The portal reflects statistics on the total blood stock availability at blood banks and provides information on blood camps, blood components, nearest blood banks etc.

## Part-C

33. **Heat Wave:** A Heat Wave is a period of abnormally high temperatures, more than the normal maximum temperature that occurs during the summer season in the North-Western parts of India. Heat Waves typically occur between March and June, and in some rare cases even extend till July.

### Consequences of Heat Waves

#### Effects on Human Health:

- High moisture at high temperature doesn't let body sweat to evaporate easily to cool itself and body temperature raises eventually causing sickness.
- Heat stroke, Heat exhaustion, Heat cramps
- Dehydration, nausea, dizziness, headaches
- Diseases transmitted by chemical air
- Heat waves is one of the biggest killers amongst all natural calamities

#### Effects on Nature:

- Heat waves can lead to droughts with decrease in moisture in the air and soil. Moisture in soil helps in cooling down the temperature by evaporation
- Some species may disappear. Few new species may appear which are heat resistant.
- Adaptations in lifestyle and behaviour of few organisms
- Wildfires in open areas or forests become frequent due to heat waves.
- Coral bleaching in oceans can rise
- Huge damage to crops leading to food shortage

#### Effects on Infrastructure and Economy:

- Heat tests the ability of infrastructure to withstand the pressure created by increased energy demand.
- Electricity transmission line expands due to heat
- Transport services gets impacted
- Loss of labour efficiency

34. Zero Budget Natural Farming (ZBNF) is a farming practice that believes in natural growth of crops without adding any external synthetic inputs like fertilizers and pesticides, and utilising in-situ biological resources to rejuvenate the soil.

The word 'budget' refers to credit and expenses, thus the phrase 'Zero Budget' means without using any credit, and without spending any money on purchased inputs. 'Natural farming' means farming with Nature and without chemicals.

India is suffering from agrarian distress for quite some time now. The rate of returns in agriculture is at very low levels. Indian farmers increasingly find themselves in a vicious cycle of debt, because of the high production costs, high interest rates for credit, the volatile market prices of crops, the rising costs of fossil fuel based inputs, and private seeds. Debt is a problem for farmers of all sizes in India. Under such conditions, 'zero budget' farming promises to end a reliance on loans and drastically cut production costs, ending the debt cycle for desperate farmers.

- A ZBNF practicing farmer has lower cost of inputs and thus has better capacity to increase the incomes.
- Interest savings, as there is no need to opt for loans.
- Higher yield, translating to better incomes.
- Increase in income through Intercrops.
- Ensures decent livelihoods to even smallholder farmers.
- Reduced usage of water and electricity, reducing input costs.
- The drought-prone regions in India are reportedly seeing promising changes already in farms with the ZBNF.
- Inter cropping adopted in ZBNF help in reducing the risks arising due to price and production fluctuations.

**ZBNF provides environmental benefits like:**

- Restore ecosystem health through diverse, multi-layered cropping systems.
- Promote regenerative agriculture, improve soil biodiversity and productivity.
- Climate resilience through diverse cropping systems
- Conservation of water
- Elimination of chemical pesticides and promotion of good agronomic practices.

ZBNF can be an important strategy to achieve the goal of doubling farmer's income by 2022, hence must be scientifically validated and mainstreamed.

**35. Solid Waste Management:** Solid waste is the unwanted or useless solid materials generated from human activities in residential, industrial or commercial areas. Solid Waste Management reduces or eliminates the adverse impact on the environment and human health. It can be classified into different types depending on their source:

- **Municipal Solid Waste (MSW):** It consists of household waste, construction and demolition debris, sanitation residue, and waste from streets, generated mainly from residential and commercial complexes.
- **Industrial Solid Waste (ISW):** In a majority of cases it is termed as hazardous waste as they may contain toxic substances, are corrosive, highly inflammable, or react when exposed to certain things e.g. gases.
- **Biomedical waste or hospital waste:** It is usually infectious waste that may include waste like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc.

### Solid waste treatment methods/measures:

1. **Thermal treatment:** Incineration is the combustion of waste in the presence of oxygen, so that the waste is converted into carbon dioxide, water vapour and ash. Also labelled Waste to Energy method, it is a means of recovering energy from the waste.  
Its advantages include waste volume reduction, cutback on transportation costs and reduction of greenhouse gas emissions.
2. **Pyrolysis and gasification:** In this method, thermal processing is in complete absence of oxygen or with less amount of air.
3. **Biological treatment methods:** This involves using micro-organisms to decompose the biodegradable components of waste. The 2 types of processes: Aerobic: This needs the presence of oxygen and includes windrow composting, aerated static pile composting and in-vessel composting, vermi-culture etc. Anaerobic digestion: Takes place in the absence of oxygen.
4. **Landfills and open dumping:** It is the controlled disposal of waste on land in such a way that contact between waste and the environment is significantly reduced and the waste is concentrated in a well-defined area. Dumps are open areas where waste is dumped exposing it to natural elements, stray animals and birds. With the absence of any kind of monitoring and no leachate collection system, this leads to the contamination of both land and water resources.

36. • DPR is nothing but a very detailed and elaborate plan for project, indicating the overall programme, different roles and responsibilities and activities and resources required. Success of a project is largely dependent on the quality of DPR.
- A DPR is a final detailed appraisal report on the project and a blueprint for its execution.

### Various Elements of a DPR:

1. **Market Planning:** The first step in the design of a project is to establish and understand the nature of the need. It is called demand forecasting. The DPR should lay down following:
 

(a) Demand forecasting	(b) Economic indicators
(c) Comparative Prediction	(d) Nature of product and services
(e) Secondary data sources	(f) Primary data sources
(g) Estimation of market share	(h) Marketing strategy
(i) The product - Market Posture	(j) Product, Price, Promotion and Place (4Ps)
(k) Product launch strategy	(l) Marketing organisation
(m) Marketing schedule	(n) Other marketing options
2. **Equipment and Process Technology (EPT):** After the market planning, design of facilities is done, which is needed to produce and deliver the products and services. This exercise is known as EPT (Equipment and Process Technology) decision.
3. **Location of the Project:** The DPR must consider the location of project. The location is quite important with respect to supply of raw material, power transmission, storage and marketing opportunity etc.
4. **Layout of the Project:** Layout has implications on the profitability and efficiency of any enterprises, safety must be very important consideration in layout.



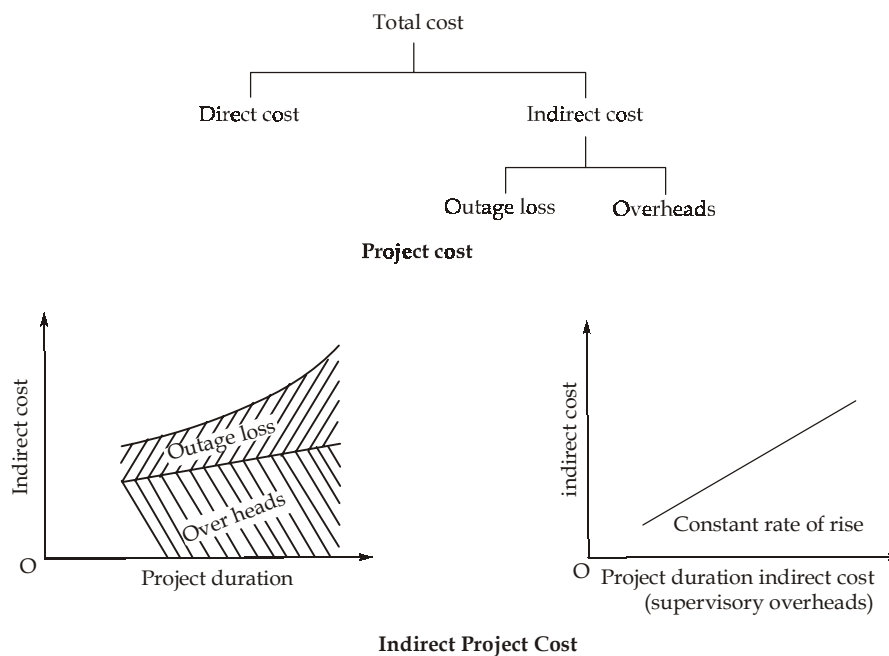
5. **Material Balance of the Project:** The DPR should provide an estimation of the total material balance for the project. It should specify the losses and buy products that may take place during handling and processing.
  6. **Specifications for Main Plant and Equipment:**
    - The DPR should provide detailed technical specifications for tendering.
    - The specifications should include the output rates and overall annualized capacity of each equipment.
  7. **Environmental Impact Assessment (EIA):** The EPT chapter of DPR should include EIA of the project. It should have specifications of environment to meet the standards.
  8. **Operations:** This chapter of DPR should have
    - (a) Capacity planning
    - (b) Plant organisation
    - (c) Personnel requirements
    - (d) Operations planning
    - (e) Vendor management
    - (f) The quality strategy
    - (g) Operations costing
    - (h) Management Information System (MIS)
    - (i) Safety
    - (j) Finishing
  9. **Commercial Aspects:** The DPR should include a section which deals which govern contractual relationships likely to occur.
  10. **Financial Aspects:**
    - The DPR incorporates a detailed projection of cost and revenue expected during the project life time of the operation phase.
    - The DPR provides projections for about 10 years of operations.
      - (a) Profit and loss statement
      - (b) The balance sheet
      - (c) The fund flow statement
  11. **Socio-Economic Aspects:**
    - It is essential to make an effort at planning stage to assess the area of population likely to be influenced by the project, therefore demographic survey is required for socio economic aspect.
    - The DPR may also include provision for community development plans such as roads, schools, hospitals, water supply, street lightings etc.
- 
37. **Cost Model Analysis:**
    - In CPM, time is related to cost and the objective is to develop an optimum time-cost relationship.
    - The overall project duration can be reduced by reducing the duration of only the critical activities in the project network. The durations of such activities may be reduced in two ways.
      - (a) by deploying more resources for the early completion of such activities.
      - (b) by relaxing the technical specifications for such activities.
    - In whole of CPM Cost Model, we will be assuming that project duration is reduced by deploying more resources on critical activities but not relaxing specifications.

- In CPM, there are two factors, time and cost estimates for each activity: 'normal estimate' and crash estimate'. In the normal estimate, the emphasis is on cost with time being associated with minimum cost. The 'crash' estimate involves the absolute minimum time required for the job and the cost necessary to achieve it. Here the emphasis is on 'time'.

**Project Cost:** The components of the total cost are shown in figure.

**(a) Indirect Project Cost**

- Indirect costs on a project are those expenditures which cannot be apportioned or clearly allocated to the individual activities of a project, but are assessed as a whole. The indirect cost includes the expenditure related to administrative and establishment charges, overhead, supervision, expenditure on a central store organisation, loss of revenue, loss of profit, penalty etc.

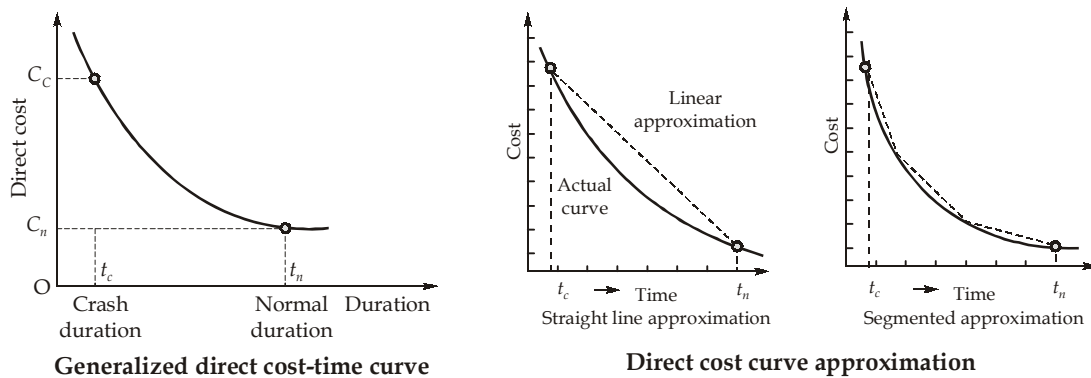


- Indirect cost rises with increased duration, considering only overhead and supervision. It is represented by a straight line, with a slope equal to daily overhead.
- But when there is a loss in profits, due to inability to meet demand or due to some penalty due to delay, a corresponding cost increase must be added to the cost of overheads, producing the curve. Such a loss is called the outage loss.
- The total indirect cost curve will thus be curved however for purpose of computation it is assumed linear.

**(b) Direct Project Cost:**

- It is the cost which is directly dependent on the amount of resources involved for completion of activities. It includes labour, materials, plants and machining etc.
- To get the same work done in less time, we have to increase amount of labour, equipment and time saving material that too at extra charges which simply means increase in direct cost.

- The project has the highest direct cost corresponding to the crash duration, and has normal cost corresponding to the normal duration.
- **Normal time ( $t_n$ )** : Normal time is the standard time that an estimator would usually allow for an activity.
- **Crash time ( $t_c$ )** : Crash time is the minimum possible time in which an activity can be completed, by employing extra resources. Crash time is that time, beyond which the activity cannot be shortened by any amount of increase in the resources.
- **Normal cost ( $C_n$ )** : This is the direct cost required to complete the activity in normal time duration.
- **Crash cost ( $C_c$ )**: This is the direct cost corresponding to the completion of the activity within crash time.



**Fig. Direct Project Cost**

- The straight line or segmented approximation of the direct cost curve is helpful in carrying out the project cost analysis. In such analysis, the cost slope is used.

**Cost Slope:**

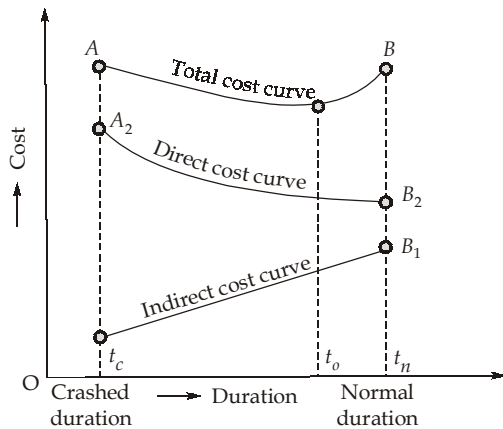
- The cost slope is the slope of the direct cost curve, approximated as straight line. It is defined as follows:

$$\text{Cost slope} = \frac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}} \text{ or } C_s = \frac{C_c - C_n}{t_n - t_c} = \frac{\Delta c}{\Delta t}$$

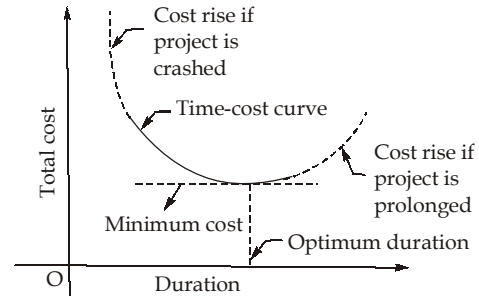
- The segmented approximation of cost curve, having multiple cost slopes, is more accurate but calculations involved are more. Generally, single cost slope is assumed.

**Total Project Cost and Optimum Duration:**

- The total project cost is the sum of the direct cost and the indirect cost.
- We find that the minimum total cost is obtained at duration known as the optimum duration. The corresponding cost is known as the minimum cost. If the project duration is increased, total cost will increase, while if project duration is decreased to the crash value, project cost will be the highest.



**Total Project Cost and Optimum Duration**



**Cost-Time Relationship of a project**

38. Department of Industrial Policy and Promotion (DIPP) under ministry of commerce is responsible for formulation and implementation of promotional and developmental measures for growth of the industrial sector, keeping in view the national and socio-economic objectives. Department of Industrial Policy and Promotion is also responsible for Intellectual Property Rights relating to Patents, Designs, Trade Marks and Geographical Indication of Goods and oversees the initiative relating to their promotion and protection. These include the outlining of policy and its implementation through the Office of the Controller General of Patents, Designs and Trade Marks. It promotes awareness regarding protection of the Intellectual Property Rights inherent in industrial property in conjunction with the World Intellectual Property Organisation (WIPO) and apex industry organisations apart from similar initiatives involving regional industry associations. It also provides inputs on various issues relating to the Agreement on Trade Related Aspects of Intellectual Properties (TRIPS) related to World Trade Organization (WTO) in these fields.
- The Department undertakes technical cooperation programmes with Property Organization (WIPO), Geneva for the modernization and upgradation of intellectual property administration relating to patents, designs, trademarks and geographical indications and the organization of Human Resource Development and awareness generation activities in the country.

**39. Satellite technology used in Defence Sector of India:**

A 2000 kg satellite called GSAT-6 is used by the Indian Armed Forces. The GSAT- 6 is capable of streaming videos in both directions. This satellite was developed for defence surveillance network-centric warfare and navigation. The launch of Radar Imaging Satellite 2 (RISAT-2) in 2009 is perhaps India's first national security satellite discussed in the public domain. This satellite uses synthetic aperture radar developed by an Israeli company for providing radar images with a resolution of one meter regardless of the time or weather conditions over an area of interest.

India also possesses world-class optical imaging satellites launched under the Cartosat series. Cartosat-1, launched in 2005, has a resolution of 2.5 metres. With the technological advances in this series, the currently operational Cartosat satellites can provide scene-specific images with a resolution better than 60 centimeters, along with the capability to capture one-minute video of the designated areas.

The Indian Navy acquired its first dedicated communications satellite, GSAT 7, in 2013, while the Indian Air Force and the Indian Army are also Set to acquire such satellites in the near future

In the recent Surgical strikes conducted by India inside enemy territory, ISRO'S roles was paramount in providing data, Visual and Intelligence.

