

a. *What are the emission standards prescribed under the MV rules to control pollution?*

Ans: The environment is a major area of concern, today, the world over. The problem has attracted attention in India too, as is evident from the concern voiced by the public, and the recent Supreme Court judgments. The air quality has indisputably deteriorated with toxic substances from many sources industry, automobiles and refrigeration air-conditioning equipment, to name a few. All combine to lead the human race towards environmental disasters like acid rain, photo chemical smog, ozone layer depletion and other ecological imbalances. Humans are the immediate victims - from headache, dizziness, eye irritation, to brain damage, respiratory problems, cancer, kidney damage and cardiovascular deaths. The power that propels automobiles comes from combustion in the combustion chamber. That is where fuel (hydrocarbons) meets air. Ideally, oxygen in the air converts all the hydrogen in the fuel into water and all the fuel into carbon dioxide. But, in reality, combustion also produces unburned hydrocarbons, oxides of nitrogen, carbon monoxide and water.

First steps to control emission:

The first ever step to control emissions was taken in California in 1964, by specifying minimum emission system control systems on cars on 1966 model cars. In 1970, the US Congress adopted the first major Clean Air Act and established the US Environmental Protection Agency (EPA). In the same year, emission control norms were being set up in Europe and Japan. The subsequent two decades norms became more comprehensive, the implementation procedure got fine-tuned and the structural framework created.

The current decade has seen these norms being tightened, and also the adoption of a long-term agenda. Europe introduced the Euro series of norms.

European emission limits in g/kwh

Heavy duty engines: European 13 - mode test India and Euro Norms:

Emissions from ECVs, LEVs and ULEVs

the first piece of legislation in India was the Air Pollution Act in 1991. The permissible level of gaseous automobile exhaust emissions was tightened in 1996. India follows the European pattern for the emission norms. For commercial vehicles with diesel engines, the norms are based on the European legislation.

The Indian government has set up April 1, 2000 as the date to implement the next set of emission standards that will apply for all the vehicles manufactured on or after that date. The new vehicles brought by the Indian auto industry has brought down emission levels production by as much as 80% as compared to 1989, but it is the older, already in use vehicles which are the main culprits. The industry has acquired, developed, and adapted new technology, and reengineered itself to produce increasingly cleaner vehicles - Low Emission Vehicles (LEVs) in 1996, and Ultra Low Emission Vehicles (ULEVs) by 2000.

The total emission has come down from 360 tones per day to 70 tones per day. During the control period, new vehicle emissions from Emission Control Vehicles (ECV), Low Emission Vehicles (LEVs) and Ultra Low Emission Vehicles (ULEVs) are outlined below:

Emissions from ECVs, LEVs and ULEVs The imposition of Euro Norms is a must if India is to be saved from the hazards of a grossly polluted environment Petrol driven four wheeler which adheres to Euro Norms H, depending on its engine capacity, would emit 2-3 times less carbon monoxide and 3-4 less hydrocarbons and nitrogen oxides than the currently stipulated levels.

The diesel version of the same, depending on the gross vehicle weight, would be required to meet emission norms that compared to present levels, are 1.2-2 times stricter for carbon monoxide and double this value for nitrogen oxides (NOx). Notably, for the first time in India, emission norms would also be set for particulate matter.

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Emission Standard

International Emission Standard for Vehicular Emission fall into three categories

1. European Emission system (EURO SYSTEM)
2. Japanese Emission system.
3. American Emission system.

The European Emission Standards are followed by most of the countries, including EURO-I are those that should have been applicable from year 2000.

EURO-II are those that should have been applicable from year 2005. The Indian Pollution standard for vehicles:

The Central Motor Vehicles Rules-115(II) 1989 says that the pollution standards laid down for carbon monoxide and inspected in petrol vehicle should be as under:

2 and 3 wheelers - Idling Carbon Monoxide emission by volume: 4.5%

4 wheelers - Idling Carbon Monoxide emission by volume : 3.0%

b. Explain significance of bus depot along with layout and list the different passenger facilities necessary.

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Ans: Considering the functional responsibility at depot level, organizational links can be arrived at by segregating different tasks from different disciplines and establishing links and relationships between different personnel.

1. Depot Manger: He has to plan for the short range requirement of vehicle, staff and material. He has to organize the depot administration through supervisors and the subordinate staff and also to co-ordinate their activities to achieve maximum productivity. He controls the operations with reference to the plan and takes all decisions regarding any change in the line of action or the plan if it becomes necessary to do so. He should motivate the depot staff by building up morale. His decision-making should depend more on proper information and data than on guess-work or hunches.

2. Traffic Incharge: He is the main manager of the depot. There are three important sub-tasks (a) Traffic planning (b) Traffic operation and (c) Line %hacking. In traffic operations, the incharge has to be alert as regards the crew position. Similarly, he has to maintain liaison with workshop incharge for ensuring the availability of vehicles. He has to look after bus station management. He has also to look after the ticket stock and traffic stationery and proper accounting of traffic revenue.

3. Workshop Incharge, He should keep the depot bus fleet in a healthy condition as well as clean and presentable. Maintenance work is segregated into skilled and the semi skilled staff requirement for 8000 or 10,000 kms. Docking". For major repair work, skilled staff if required, while semi-skilled staff is used for daily and weekly maintenance and minor repair work. He should organize shifts and allocate staff according to workload as well as the requirement of material for repairs and maintenance. He should watch the consumption of fuel, oil and auto stores and take remedial reassures. Similarly, he should give feed back to central stores on the quality of material. He has to analyze the breakdowns for material failure, system failures or human failures and take corrective action.

4. Stores Asstt. : Adequate provisioning of stores and float assembly. Time indenting for the material, Proper accounting of new material, issued and the used material received in stores, Avoiding over stocking and stock-outs Proper watch on consumption of material and prompt reports on excessive consumption to workshop Incharge and depot manager. Feed-back on quality of material in consultation with workshop Incharge.

5. Accountant : Accounting (a) Personnel expenditure like salary payments, overtime, control recoveries, travelling and daily allowances, medical bills,

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(b) Contingency payments like electricity, water, telephone etc., local purchase of material, other misc. expenditure, (c) Stores Accounting like diesel and oil, spares parts consumed at depot, (d) auditing like tickets and conductors waybill, abstracts, casual or special contract bills, other misc. earning etc.

6. *Administrative Assistant*: Responsible for administration and personnel activities like personnel records - leave, increments etc., sanction of leave, temporary promotion, temporary posting or placement or transfer, labor complaints, default actions, case handling, administrative circulars / instructions etc.

7. *MIS (Management Information System) Assistant*: Responsible for collection of relevant information from different sections, and processing the same for decision makings, planning and control. The required information is to be forwarded to the middle management. He should sample-check the reliability and accuracy of data compiled at different sections and report to depot manager.

The organizational structure of the depot level is shown in annexure.

Passenger amenities

with the growth of public sector in the transport industry, the expectations of traveling public, not only in respect of the actual provision of transport facility but also the supporting facilities, have been on the increase. It is said that human being is the most difficult thing to be transported. The reason mainly is because he refuses to be treated as a piece of commodity. The need for passenger amenities.-would has been the minimum in transport industry, if it is possible to offer service the moment it is demanded. This is not possible mainly because the individual needs will have to be segregated on a time basis and the service prodded to approximate the convenience of several passengers so as to obtain as even a load as possible.

Till recently the expectations of passengers have not been very high in that they were satisfied, if the service is provided at certain intervals. But with the general growth of awareness, there is a silent but firm demand for more and more passenger such as bus stations, bus shelters and other facilities. Protection form weather, provision of drinking water and sanitary / toilet facilities are basic amenities to be provided. Depending upon the size of the bus station of shelter, amenities such as refreshment rooms/canteens, waiting halls, postal and telephone facilities, cloak rooms, etc. are provided. Some other amenities supplied were book stalls, fruit stalls, wall clocks weighing machines, good porter facilities, advance booking and reservation counters, inquiries and public address systems and police outposts. Regarding the public information needs, the time-table boards in the bus stations should be regularly brought up-to-date and information on late arrivals and departures should be indicated on sign boards at prominent place. In bigger bus stations, public address system should be installed. The announcement should be made in the regional languages, Hindi and English. The information given on sign boards also should be in all the three languages.

Q.No 2. a. What documents are needed to register a newly purchased heavy commercial vehicle?

Various important documents required to keep with the vehicle while driving and must produce original if demanded by police officer in uniform or an officer from motor vehicle dept.

Valid documents for transport vehicles. (Trucks, trailers, tankers, buses, etc.).

1. Certificate of registration (R.C).
2. Certificate of taxation (T.C).
3. Certificate of fitness (C.F).
4. Road permit (R.P).
5. Insurance certificate.

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6. P.U.C certificate.
 7. Professional tax NOC.
 8. Entry tax NOC (for out state vehicles).
- Valid documents for Non-Transport vehicle. (Cars, Motorcycle, Sumo, Jeep, etc.).
1. Certificate of registration (R.C).
 2. Certificate of taxation (T.C).
 3. Insurance certificate.
 4. P.U.C certificate.
 5. Entry tax NOC (tax outside state vehicle).

Q.No. 2. b. Mention the duties of conductor & drivers of State Transport Organisation

Ans:

The duties of the stage carriage and contract carriage drivers and conductors are as follows

1. He should not allow any person or thing to be placed or to be in the space reserved for the driver's seat in such a way as to interfere a clear vision of the road and control of the vehicl.
 2. He should take care to keep the vehicle in fit and proper condition and should not drive the vehicle in defective condition.
 3. He should not smoke on duty.
 4. He should be clearly dressed as specified by the Regional Transport Authority and should behave in manners with the passengers.
 5. He should not unduly delay on the journey.
 6. Incase of mechanical break-down or other cause beyond his control, he should., arrange to convey the passengers to their destinations in some other vehicles.
 7. He should have regard to his duties and should follow the rules and regulations.
 8. He should not allow any person to whom he believes to be suffering from any infections or contagious disease, to be carried in the vehicle.
 9. He should carry his licence while driving a vehicle and should produce the same for inspection when asked for by a Police Officer or concerned authority in it uniform.
 10. He should produce the Registration Certificate, taxation certificate, insurance certificate of the vehicle, the fitness certificate and the permit for verification Ld when demanded by the authority.
 11. The drivers should stop the vehicle and keep it stationary:
 - (i) When asked to do so by a police officer in uniform.
 - (ii) When required to do so by any person in charge of an animal who feels that the animal will be unmanageable if alarmed.
 - (iii) When the vehicle is involved in an accident.
 12. In case of the accident, the driver should give his name and address to the person affected by the accident.
 13. In case of accident, the driver should provide the necessary medical treatment to the person injured and should report the accident within 24 hours to the nearest police station.
- A conductor, in relation to a stage carriage means a person engaged in collecting fares from passengers, regulating their entrance into and exit from the stage carriage and the maintaining the discipline, within the carriage. Since he has required to have a he conductors license.

Necessity for conductor's license:

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it 1. No person shall act as a conductor of a stage carriage unless he holds an effective conductor's license issued to him authorizing him to act as such conductor, and no person shall employ or permit any person who is not so licensed to act as conductor of a stage carriage.

id 2. A State Government may prescribed the conditions subject to which, shall not apply to a driver of a stage carriage performing the functions of a conductor or to a

Lot person employed to act as a conductor for a period not exceeding one month. Grant of conductor's license:

1. Any person who possesses such minimum educational qualification as may be prescribed by the State Government and is not disqualified, and who is not for the time being disqualified for holding or obtaining a conductor's license may apply to the licensing authority having jurisdiction in the area in which he ordinarily resides or carries on business for the issue to him of a conductor's license.

2. Every application shall be in such form and shall contain such information as may be prescribed.

3. Every application for a conductor's license shall be accompanied by a medical certificate in prescribed form, signed by a registered medical practitioner and shall also be accompanied by two clear copies of a recent photograph of the applicant.

4. A conductor's license issued shall be in prescribed form and contain such particulars as may be prescribed and shall be effective throughout the State in which it is issued.

5. The fee for a conductor's license and for each renewal thereof shall be one-half of that for a driving license.

Disqualifications for the grant of conductor's license:

1. No person under the age of eighteen years shall hold, or be granted, a conductor's license.

2. The licensing authority may refuse to issue a conductor's license —

(a) if the applicant does not possess the minimum educational qualification;

(b) if the medical certificate produced by the applicant discloses that he is physically unfit to act as a conductor; and

(c) if any previous conductor's license held by the applicant was revoked. Revocation of a conductor's license on grounds of disease or disability

Q.No. 2. c. Write briefly history of transport industry development in India.

Motor vehicle industry has attracted the attention of economist the world over. But the India Motor Vehicle industry had few takers. In the early eighties when the industry was poised for the greatest transformation in over 20 years the economic studies of the industry was strongly felt by a group of economists in the centre for development studies. The Indian motor industry came to grow within the environment of industrial regulatory policy and the specificities of demand The growth pattern was, however, shaped by the specificities of the industry as well, which had its own implications in the developing country context.

The Motor Vehicle Industry: Early Beginning

Up to almost the end of World War I complete motor vehicles were imported either directly from abroad or through dealers / agents in India. The number imported was not more than 4000 vehicles per year, both passenger cars and commercial vehicles. It was only after 1920 that local assembly of vehicles, from components and parts imported in condition, was started in a few units set up in Bombay, Madras and Calcutta, by two foreign manufacturers.

Assembly / import of vehicles increased substantially since the twenties and crossed 30,000 units by 1930 (constituting about 17,000 passenger cars and 15,000 commercial vehicles).

After a decline in the depression years, the number of vehicles assembled / imported, increased up to the Second .World War period. During the War the average fell to about

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20,000 vehicles per year in the first the number dwindled even further to 7,000. The decline was sharpest in respect of passenger cars. After the war, import / assembly of the vehicles increased substantially to around 40,000 in 1948-49 (cars being more than commercial). Hence, from the thirties there was a rise in the Vehicle Park (total vehicles on the roads at any time) followed by a gradual growth of a substantial repair and replacement sector with diverse skills associated with it. Already, by the end of the War the importance of establishing an automobile industry with indigenous capital was realized. Two companies, Hindustan Motors (HM) and Premier Automobiles (PAL) were set up in the mid-forties with foreign technical collaboration and a programme for progressive manufacturing complete automobiles. The late forties and early fifties marked the beginning of the motor vehicle industry in India with import of complete vehicles being disallowed. The two approved manufacturers, HM and PAL commenced operations for assembly of c.k.d. vehicles and simultaneously installed plant and equipment for the manufacture of a few vital components. By 1952, manufacturing programmes of three more firms were approved. Each had made differential progress in respect of in-house production of certain components by 1952 (the year the First Tariff Commission on the automobile industry was appointed). Besides these five companies with manufacturing programmes there also existed seven pure assemblers (see list below) all of which had tie-ups with foreign manufacturers.

Q.No. 3. a Write short note on 'Control of Traffic.'

Ans: To reduce the accidents on the roads, different measures are employed like traffic signals, one way traffics, traffic polices, traffics sign boards etc. In advanced computer age the various computer controlled systems are being used for controlling the traffic on the roads. The various systems like satellite communication for getting the proper identification of vehicles in a particular place, measuring the vehicle speed and thus controlling the over speed riding etc.

To reduce traffic conjunction car navigation system is very common in many of countries. In India this navigation systems is being introduced by few companies like Alpine Car Navigation. In this age of ever more complex road systems and increasingly heavy traffic, it is not always easy to stay on course. Road maps are all but obsolete. What we need today are innovative solutions. Solutions that make easier for driver by automatically selecting the right route and guiding the vehicle reliably to the desired destination. You will know where exactly you are and where you are heading, because the car navigation system operates GPS (Global Positioning system) with a digital road map holds all the information the system needs to show you the way.

Q.No. 3.b Classify various modes of transports with advantages and disadvantages. (land, air, water).

1. Transport of goods involves two major factors i.e. the vehicle or unit of conveyance and the medium in which or upon which it moves. Transport can be classified from to angles —

- (a) According to the track or vehicle used i.e.
 - (i) Land transport - it includes both road and rail transport,
 - (ii) Water Transport, and
 - (iii) Air Transport.
- (b) According to the energy used in moving the vehicle i.e.

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i) Manual (ii) Animal (iii) Mechanical

(iv) Heat (v) Automatic etc.

Economic Significance of the Road Transport

Improved transportation is a measure of the ability of a society to apply science in practice.

The efficiency of transportation is an index of the determination and capacity of a society to secure an optimum utilization of its resources in order to achieve economic growth and improve standard of living of the people.

An efficient network of transport supports existing level of economic activity in society and helps in the economic growth. Let us know the economic significance of improved transportation:

7. Transport promotes price stabilization and equalization: The drought, flood, earth-quakes etc. are no more so serious with the development of modern transport means. Crop failures are less serious to the community as supplies can be made from outside. Local over-production can also be disposed of through the transport means to stabilize the prices.

Transportation and Land values: It is because of the transportation; development of natural resources at a great distance from the markets is possible. Millions of acres of land at a close proximity to the railways and highways have become more valuable than ever before.

3. Transportation and Reduction of Prices: Improved transportation reduces the freight rates, an important element in the total cost of goods. The cheap transportation reduces the price of raw material. It also facilitates geographical division of labor.

4. Transportation and large scale production: Cheap transportation encourages large scale production by enabling large scale transportation of raw material, finished goods or both.

5. Transportation and urbanization Cheap transportation makes large cities possible. It gives positive stimulus to urban concentration.

The role of road transportation in the economic, social and political development of a country has been well-recognized from even the ancient times. The civilization of a country in the earlier days was judged depending upon the transport facilities a country had. With mechanization of the transport and introduction of automobiles, the need for better roads has been felt. In the last five decades the road transport industry has taken rapid strides and has achieved remarkable advances in speeds, comfort and safety. In a country like ours, where 70 to 80 % of the population lives in the inferior hinterlands of the country, economic growth could be achieved only by providing proper networking of roads and adequate road transport facility. The agricultural products produced in rural areas can be transported to the marketing and the urban areas where economic and trade activity flourishes resulting in the economic growth of the country. The economic growth of a country can be mainly measured by the increase in per capita income and the gross value added to the production. The economic growth of a country can also be measured by the amount of employment potential i.e. over employment and under employment. The economic growth is also directly related to industrial growth with stability. Transport is the backbone of the industrial growth as the product produced at any location can be distributed all over the country where the market exists. Road transport is the cheapest mode of transport without much capital investment. It is having an easy accessibility to underdeveloped areas where other modes of transport such as rail, air or water cannot reach. India being a very vast country and population spreading all over the land, railways are not as popular as road-ways, as the railways can't reach all the remote areas of the country.

Advantages of Road Transport

1. Marketing: It leads to better marketability and distribution of goods and stabilization and equality of prices.

2. Means of communication: Better road transport provides good and effective means of communication to rural areas.

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3. Employment potential: The roadways provide employment to various classes of the society for the formation and the maintenance of roads. It also provides employment for operating and maintaining a vehicle as well as in administrative requirements of the transport industry. While some tendency for gradual replacement of bullock carts by motor vehicles is in evidence in some parts, the progress is slow in view of the fact that rural roads still continue to be either kutcha or unsurfaced, and, therefore, the bullock cart will continue to remain as the principal mode of transport for several years to come. Bullock carts provide employment to as many as 20 million people, that is, on par with the employment afforded by organized industries. This mode also would need encouragement as a national policy, in the context of the energy crisis.

Q.No. 3.c. What are the role played by vehicle research development establishment CIRT in transport undertakings?

Ans: The Central Institute of Road Transport (CIRT) was established in 1967 on the joint initiative of the Association of State Road Transport Undertakings (ASRTU) and then Ministry of Shipping and Transport, Government of India.

The main objectives of CIRT are —

- (a) To promote and provide for the study of the principles and practices of organization and management in various spheres of public transport.
- (b) To conduct research on critical issues in transport development and to undertake consultancy assignments to improve organizational effectiveness and operational efficiency.
- (c) To impart training and education to all categories of managers and professionals engaged in furthering the cause of public transport.
- (d) To help the government and its agencies in evolving integrated policies and legislative framework to enable a balanced growth of the transport sector.
- (e) To be the clearing house of ideas, information and data pertaining to transport industry with specific reference to safety, environment and productivity.
- (f) To lay down standards, specifications and norms for various materials used in heavy vehicles through performance evaluation, material analysis and quality monitoring.
- (g) To undertake research for improvement and technological up gradation of vehicles used for passenger transportation together with their components and assemblies.
- (h) To engage in any other activity as may be conducive or incidental to the attainment of the above objectives.

In fulfillment of the above objectives, CIRT established an Engineering Research Centre consisting of Automotive, Electrical, Chemical and Metallurgical laboratories. To begin with, certain basic equipment was acquired and the necessary test rigs were fabricated in-house.

These were later upgraded in respect of instrumentation and computerization.

The Institute conducts engineering research in its testing laboratories. Over the years, the laboratories have expanded to meet the growing need for automobile component testing. The testing laboratories have also been recognized by the Bureau of Indian Standards and identified by the European union for certification of automobile components earmarked for export to Europe.

A large number of STUs, vehicle and component manufacturers make use of CIRT's testing facilities to evaluate the quality of components and spare parts they make and purchase. The Standing Committee (Supplies and Contracts) of ASRTU awards rate contracts on the basis of CIRT's certification. This process has enabled manufacturers and suppliers to maintain consistency in the quality of their products. The Institute's laboratories have been of immense help to auto-ancillary manufacturers, particularly to those who do not have sophisticated test facilities. The research activities of the Institute are essentially in the realm of applied

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research. In collaboration with the Maharashtra State Road Transport Corporation, CIRT undertook field trials of the rear engine passenger bus chassis. Extensive work has also been done on bus body design and the aerodynamic bodies designed by CIRT have resulted in fuel efficiency.

In order to ensure continuous improvement in the quality of the components and materials, CIRT undertook drawing up of specifications in collaboration with both the users and the manufacturers. CIRT has been conducting periodic conferences and workshops to foster a healthy interaction between manufacturers and users. These exposures have helped develop a greater understanding of one another's point of view, apart from upgrading specifications and testing processes for ensuring an increasingly higher quality of components and materials.

• The production of automobiles in India has witnessed a quantum jump with multinational automobile giants converging to take advantage of growing market and the strong engineering base. It is CIRT's endeavor to provide state-of-the-art facilities for testing the whole range of automobile components and materials which will enable India's ancillary industries to measure their own quality, both for meeting the demand from within the country and exploring opportunities for export. The leadership CIRT has been providing in improving the quality of management in the transport sector through its training, consulting and research activities, will be equally matched in creating a modern automobile component testing centre in the cause of making the transport sector an effective partner in strengthening India's social and economical infrastructure

Q.No. 4.a. How do you work out operational cost of a transport organization ? Indicate what Costs are categorized as fixed ? what costs variable?

Ans:

The total working cost incurred in connection with the business of transportation of passengers is termed the "Cost of Operation" or "Operating Costs". The operating costs include all items of expenditure incurred in connection with operation of services, including depreciation and interest on capital but does not include passenger tax and appropriations from the net revenues. The total cost of operation is generally classified into two categories namely I

1. Indirect costs or fixed costs or overheads, and

2. Direct operation cost or variable cost. The indirect costs or fixed include such items of expenditure which are incurred whether or not a vehicle is run and irrespective of the volume of services. Over short periods, such costs are not affected by changes in the volume of operation, whether in terms of kilometers covered or number of passengers carried. Indirect costs consists of expenses incurred on behalf of the operation as a whole and cannot be assigned to any particular service or part of the operation. The following items generally assigned as indirect or fixed costs

1. Depreciation on assets other than vehicles, interest on capital loans etc.
2. Depreciation on vehicles due to ageing.
3. General administration expenses including contingent expenses.
4. Motor vehicle and other taxes and insurance, and all other expenses not included under direct operational costs.

Direct operational cost or variable costs include all items of costs which have to be incurred for the actual running of the vehicles. Such costs are related to the activity itself rather than to the administrative framework which makes the activity possible. In other words, the cost that can be assigned to the service and which would not be incurred if the services were not

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operated are classified under this group. Such assignable costs include those expenses which over a period of time vary directly with the volume of operations, that is to say, with kilometer covered. The direct operational cost is also termed as “running cost” or “propulsion cost” and includes the following items namely

1. Depreciation on vehicles due to operation.
2. Fuels and lubricating oil, auto stores, tires and tubes.
3. Traffic and workshop staff.
4. Traffic stationary including cost of tickets and other miscellaneous operating expenses.

The cost per kilometer is called as the ratio of the total cost to the total number of kilometers operated. It is evident that by improving the fleet and vehicle utilization, the per kilometer cost can be substantially brought down since the element of fixed cost would be spread over a larger kilometrage. What is more, a high level of vehicle utilization can also reduce the element of variable cost in the per kilometer cost of operation since, the cost of the crew, which is a substantial element in the variable cost, gets spread over a larger kilometrage. Thus, a high level of fleet and vehicle utilization is clearly a good indicator of productivity in bus operation. However, a more critical and analytical study is necessary to evaluate the significance of the various components in the cost of operation which affect the economies and diseconomies in bus operation

Q.No. 4.b. What alternative fuels are being tried on experimental basis to keep transport vehicle in operation?

Ans: The alternative fuels aspiring to take the place of petroleum are:

(1) Liquefied Petroleum Gas:

LPG is a gaseous hydrocarbon at room temperature and atmospheric pressure. It can be liquefied by cooling or compressing. On liquefaction, its volume reduces to 1/250 of its gaseous form. It is composed of hydrocarbons having carbon numbers 3 to 4. Principal components of LPG are - Propane, Propane, butane, butane or mixture of propane and butane. LPG has extremely high volatility under reduced pressure. Due to this, they are stored in sealed pressure vessels (tanks) and their flow to the engine cylinders is controlled by special equipments. Use of LPG as automotive fuel has several advantage although there are disadvantages too. These are

1. Better mixing with air due to complete vaporization.
2. No carbon deposits.
3. High octane rating.
4. No need of a fuel pump in fuel supply system.
5. No vapor formation and therefore no crankcase dilution.
6. Closer control of air-fuel ratio. Uniform mixture supply to all cylinders in a multi-cylinder engine.
8. No gum formation.
9. Only a few uncombined hydrocarbons in exhaust system due to correct mixing of air and fuel.
10. No condensation of fuel on the way to the engine through carburetor.
11. High antiknock value.

Disadvantages of LPG:

1. Heavy pressure cylinders are needed for storage.
2. Vehicles weight increases due to storage cylinders.
3. A special fuel supply system has to be used.
4. Calorific value lower than petrol.
5. Power generated is less than the generated in gasoline engine.

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With propane's simple molecular composition, propane - fueled vehicles emit significantly lower levels of carbon monoxide, hydrocarbons and nitrogen oxides than gasoline - fueled vehicles. The level of air - toxic emissions from propane - fueled vehicles is also low. According to the National Propane Gas Association, U.S.A., spark plugs from a propane vehicle last from 80,000 to 100,000 miles and propane engines can last two to three times longer than gasoline or diesel engines.

(2) Ethanol:

Ethanol (ethyl alcohol, grain alcohol, ETOH) is a clear, colorless liquid with a characteristic, agreeable odor. Two higher blends of ethanol, E-85 and E-95 are being explored as alternative fuels in demonstration programs. Ethanol is also made into ether, ethyl tertiary-butyl ether (ETBE), that has properties of interest for oxygenated gasoline and reformulated fuels. The environmental benefits of ethanol include: 10% ethanol blends reduce carbon monoxide better than any other reformulated gasoline blend. Ethanol is a safe replacement for toxic octane enhancers in gasoline such as benzene, toluene and xylene. ETBE lowers gasoline volatility and is, thus, particularly effective in reducing VOC emissions from automobiles.

(3) Methanol:

Methanol (CH_3OH) is an alcohol fuel. As engine fuels, ethanol and methanol have similar chemical and physical characteristics. Methanol is methane with one hydrogen molecule replaced by a hydroxyl radical.

It is produced from natural gas in production plants with 60% total energy efficiency. Methanol can be made with any renewable resource containing carbon such as seaweed, waste wood and garbage.

This is a promising alternative, with a diversity of fuel applications with proven environmental, economic and consumer benefits. It is widely used today to produce the oxygenate MTBE added to cleaner burning gasoline. Cars, trucks and buses running millions of miles on methanol have proven its use as a total replacement for gasoline and diesel fuels in conventional engines. Methanol offers the greatest hope for early and broad introduction of fuel cells that will make Electric Vehicles practical within the next few years. Whether reformed to provide hydrogen for conventional fuel cells or used directly in the latest liquid fed cells, methanol will overcome the greatest remaining obstacle to commercialization, by offering the only economical way to transport and store the hydrogen needed for fuel cells. Methanol fuel cells will greatly reduce carbon dioxide emissions for vehicles and virtually eliminate smog and particulate pollution.

(4) Bio Diesel:

Biodiesel (mono alkyl esters) is a cleaner-burning diesel fuel made from natural, renewable sources such as vegetable oils. Just like petroleum diesel, biodiesel operates in combustion-ignition engines. The use of biodiesel in a conventional diesel engine results in substantial reduction of unburned hydrocarbons, carbon monoxide, and particulate matter. It also decreases the solid carbon fraction of particulate matter (since the oxygen in biodiesel enables more complete combustion to CO_2), eliminates the sulfate fraction (as there is no sulfur in the fuel), while the soluble, or hydrocarbon, fraction stays the same or is increased. Therefore, biodiesel works well with new technologies such as catalysts (which reduces the soluble fraction of diesel particulate but not the solid carbon fraction), particulate traps, and exhaust gas recirculation (potentially longer engine life due to less carbon).

(5) Electric Fuel:

Electricity is unique among the alternative fuels in that mechanical power is derived directly from it, whereas the other alternative fuels release stored chemical energy through combustion to provide mechanical power.

Batteries commonly provide electricity used to power vehicles, but fuel cells are also being

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explored. Batteries are energy storage devices, but unlike batteries, fuel cells convert chemical energy to electricity. A large number of various types of batteries are being tested for use in EV. Some of the technologies being used or evaluated include lead-acid, nickel cadmium, nickel iron, nickel zinc, nickel metal hydride, sodium nickel chloride, zinc bromine, sodium sulfur, lithium, zinc air, and aluminum air.

The first benefit of using electric fuel is that you are not polluting the environment. Although, some people argue that there are some emissions that can be attributed to the emissions that are generated in the electricity production process at the power plants. The maintenance costs for EVs is less-EV have fewer moving parts to service and replace.

(6) Hydrogen:

Hydrogen gas (H₂) is being explored for use in combustion engines and fuel-cell electric vehicles. It is a gas at normal temperatures and pressures, which presents greater transportation and storage hurdles than exist for the liquid fuels. Storage systems being developed include compressed hydrogen, liquid hydrogen, and chemical bonding between hydrogen and a storage material (for example, metal hydrides).

While no transportation distribution system currently exists, for hydrogen transportation use, the ability to create the fuel from a variety of resources and its clean-burning properties make it a desirable alternative fuel. Increasing pollution from cars and airplanes has created smog clouds across the country. Hydrogen, on the other hand, emits no toxins, and is also clean and efficient.

(7) Natural Gas (CNG / LNG):

Natural gas is a mixture of hydrocarbons-mainly methane (CH₄) and is produced either from gas wells or in conjunction with crude oil production. The interest for natural gas as an alternative fuel stems mainly from its clean burning qualities, its domestic resource base, and its commercial availability to end-users.

Natural gas is the cleanest burning alternative fuel emissions are much lower than those from gasoline-powered vehicles. For instance, NO_x emissions of carbon monoxide are approximately 70 percent lower, non-methane organic gas emissions are 89 percent lower, and oxides of nitrogen emissions are 87 percent lower. In addition to these reductions in pollutants, NGVs also emit significantly lower amounts of greenhouse gases and toxins than do gasoline vehicles. Dedicated NGVs produce little or no evaporative emissions during fueling and use. For gasoline vehicles, evaporative and fueling emissions account for at least 50 percent of a vehicle's total hydrocarbon emissions. Dedicated NGVs also can reduce carbon dioxide exhaust emissions by almost 20 percent vehicles.

The CNG vehicles are languishing with repeated shortages in CNG supplies. In the absence of compressing facilities, natural gas continues to be flared. The prospects of Oman and Iranian pipelines for importing of natural gas have receded. A brief and isolated experiment with 30% methanol blended petrol has been forgotten. The prospects of solar photovoltaic cells as energy source for vehicles have not even been explored so far.

The Indian oil industry and the Government of India should join hands to make future fuels a thing of the near future, and not relegate it to the backseat. The components of a CNG conversion kit for petrol cars are : *CNG Cylinder* : These are high-pressure cylinders designed for storage of CNG at a pressure of 200 bar. A typical tank capacity is 60 liters. The number of cylinders required depends on the vehicle. *Vapor bag Assembly*:

This is made of PVC and is designed to cover the cylinder valve. It is tubular in shape and has a threaded flange at one end screwed on to the cylinder neck threads and a screwed cap at the other end to give access to the cylinder valve. *CNG pressure regulator* : It is a multistage pressure reducer in which the gas pressure reduced from that prevailing in the tank to a pressure just below the atmospheric pressure. This ensures that natural gas will not flow out from the pressure regulator when the engine is not running. The filling connection/valve is

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used for filling high-pressure gas from the CNG compressor to the CNG tank. The electronic selector/change-over switch activates the electrical circuits in the system to automatically change the mode of operation from diesel or petrol to CNG. Venturi is a gas and air mixing and metering device. It meters the gas flow proportionate to the engine speed.

The components of a CNG conversion kit for dual fuel operation in diesel engines are :

Special filler valve for filling CNG storage tanks; multi-stage pressure regulator to regulate pressure from 200 bar to less than the atmospheric pressure; pneumatically operated safety valve to close gas supply as the engine rpm reaches beyond specific limits; linear load valve connected to accelerator paddle controls gas flow as per engine load;

rack limiter allows load diesel flow up to certain engine rpm and reduces pilot valve beyond the specific speed; and Venturi, the gas mixing/and metering device located downstream of the engine air filter.

The components of the kit for mono fuel operation are : High-pressure cylinders designed for storage of CNG at a pressure of 200 bar. A typical tank capacity is 50 ltrs. The number of cylinders required depends on the vehicle; special filter valve for filling CNG storage tanks; two pressure regulators to reduce the gas pressure from 200 bars to just above atmospheric pressure; special air valve diaphragm carburetor; six cylinder contact-less distributor ignition system with spark plugs located in the place of injectors; and special electronic governor to reduce gas flow at second stage regulator as the specified rpm reached.

(8) P-Series:

P-Series is a new fuel that is now classified as an alternative fuel. It is the latest to be taken under the branch of alternate fuel. The U.S. Government has only recently added certain blends of methyltetrahydrofuran, ethanol and hydrocarbons, known as the P-series fuels, to the definition of "alternative fuel."

P-series fuels are blends of ethanol, methyltetrahydrofuran (MTHF), and pentanes plus, with butane added for blends that would be used in severe cold-weather conditions to meet cold start requirements. These contain at least 60 percent non-petroleum energy content derived from MTHF (manufactured solely from biomass feedstock's) and ethanol, are substantially not petroleum and may yield substantial energy security and substantial environmental benefits.

(9) Solar Fuel:

Solar energy technologies use sunlight to warm and light homes, heat water, and generate electricity. Some research has gone into evaluating how solar energy may be used to power vehicles; however, the long-term possibility of operating a vehicle on solar power alone is very slim. Solar power, may however, be used to run certain auxiliary systems in the vehicle. Solar energy is derived from the sun. In order to collect this energy and use it to fuel a vehicle, photovoltaic cells are used. Pure solar energy is 100% renewable and a vehicle run on this fuel emits no emissions. The Indian scenario is however not encouraging. The experimental vehicles supplied by BHEL and Chatterjee are being stranded for want of spare parts.

Q.No. 5. a. Explain the Taxation structure for passenger and goods transport vehicles.

Ans:

Taxes on motor vehicles

1. B.M.V. Tax:

The vehicles used or kept to be used in the state of Maharashtra are liable for the payment of B.M.V. Tax as per the provisions made under the B.M.V. Tax Act, 1958.

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2. Passenger tax:

Passenger tax is levied on passengers for the vehicles used as a stage carriages.

3. Professional tax:

The transport vehicles used for commercial purpose are liable to pay the professional tax annually at the rates:

1. Three wheelers : Rs. 500
2. Taxi cabs, 4 wheeler goods and passenger vehicles Rs. 750

4. Entry tax:

If the new vehicle is purchased from the other state or the vehicle registered in other is brought to Maharashtra state within 30 months from the date of its first registration, is liable for payment of Entry tax under the provisions of Entry Tax Act. Entry tax is not applicable to the vehicles belonging to the employees of central government nationalized banks as such vehicles are brought to Maharashtra state because of their transfers.

5. Octroi duty:

The vehicles which are registered in municipal corporation area are liable to pay octroi at the rate fixed by the respective municipal corporation.

2.3 BASIS OF TAXATION

One Time Tax on Non-Transport Vehicles

On motorcycle, cars, mopeds, jeeps etc. registered in non-transport category, one time tax (OTT) is levied and collected. Cost of vehicle forms the basis of taxation in the case of non-transport OTT payable Vehicles. A cost of vehicle in relation to vehicle manufactured in India means cost as per the purchase invoice of the vehicle issued either by the manufacturer or the dealer of the vehicle and it includes the basis

Manufacturing Cost + Excise Duty + Sales Tax

While levying OTT to imported vehicles the bill of entry forms the basis of taxation.

Rate of One Time Tax % of cost of vehicle Manufactured in Motor cycle / tricycle 7 % 21 %
India

LMV / Omnibus 4 % 12 %

OTT - Taxes on transport vehicles

Payment of OTT for LMV (Transport) is mandatory for the new vehicles registered after May' 2000. But for old vehicles registered prior to May' 2000, it is an optional. They can either adopt an yearly method or OTT. While assessing the OTT for old LMV's their present annual rate of tax and the age of the vehicle is considered. And the OTT is fixed whereas in the case of new LMV's 7 times the annual prevailing rate of tax is levied and collected.

Annual Tax

1. Goods Vehicles : Vehicles not eligible to pay OTT like Trucks, Tempo, Buses, Auto rickshaw, can adopt quarterly, half yearly or yearly method of tax payment.
2. Passenger Vehicles : Seating capacity, type of permit and construction of vehicle forms the basis of taxation of passenger vehicles. Rate of taxes for ordinary buses tourist buses and luxury buses are different, taxes on these vehicles can be paid quarterly, half yearly or yearly.

Q.No. 5.b. What records are required to be maintained by a Goods Transport working? Explain their usefulness.

Ans: The basic documents necessary for a any transport operation are as follows:

1. LogBook:

Each vehicle has a log book which contains the details about the running time for a trip and allied factors. The data like the station, date, start, stop time are written in the log book by the

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driver. At the end of trip, the driver produces the log book along with other documents. The log book gives the clear picture about a trip. It gives information regarding running time, idle time, rest time, distance covered etc. The log book records play an important role in deciding the routes, scheduling time-table and economy of goods transport.

Trip Operational Sheet (T.O.S.):

The T.O.S. gives the detailed information about a trip. The T.O.S. number is the total trip number of a particular vehicle.

T.O.S. gives information about

- (a) The loading (Dispatching) and unloading (destination) points.
- (b) The distance between stations.
- (c) The number of days taken for a journey.
- (d) Number of idle days.
- (e) Fuel consumption, lubrication consumption.
- (f) Repairs and spares, miscellaneous accessories.
- (g) Fines and expenses incurred during journey.
- (h) Commissions and general expenses.
- (i) Government and municipal charges.
- (j) Salary.

All the above information is summarized in another column called the total expenses column. The summarized information gives details about

- (a) The total truck hire as against each pay order is given in the truck hire column.
- (b) The cash account column indicates the cash balance recoverable and payable.
- (c) Columns are provided for a short report on the repairs carried out during the trip, reasons for delay, extra fuel and oil consumption etc.

A check list of the documents with the vehicle is also given in the T.O.S. Thus T.O.S. is the mirror of the trip. Each and every minute details is revealed from T.O.S. and it becomes much easy to analyze a trip.

3. Vehicle Ledger: *r*

The data obtained from T.O.S. is posted in a ledger called the Vehicle Ledger. The trip is indicated by the trip number which is also the T.O.S. number. Additional columns are provided for gross profit before vehicle tax, depreciation and tyre cost. The balance of cash available is given in the last column. Thus the vehicle ledger is a collective record of the trips exposing the financial aspects of the transportation.

4. Truck History Card:

The performance of a truck is evaluated from the truck history card. This card gives detailed information about the mileage, tax paid, number of repairs etc. Thus the truck history card helps in deciding whether to scrap the truck or not.

5. Monthly Operational Performance Statement (M.O.P.S.):

The performance of a vehicle during a month is revealed by the monthly operational performance statement. The actual working of the vehicle is tabulated in the M.O.P.S. and is compared with standards that have been laid down *for* its performance. The variations in performance are noted and the reasons for them are given. The owner can give attention to those field, here the performance is very poor and immediate corrective action is taken. Thus M.O.P.S. gives the retrospective effect and points out the regions of inefficiency.

Apart from the above documents which basically deal with the records of the vehicle and its performance, following documents are necessary for any sort of goods transport.

- (a) Goods Consignment Note: It is known as the Lorry receipt, Billoi or Mother receipt. It is the acknowledgement by the carrier of the receipt of goods, giving its nature, description, weight, volume, received by the carrier. It also gives the destination to be reached, freight charges and terms and conditions of contract of carriage. The carrier can limit his liability

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against fire, theft, accident etc. but not against damage or loss arising out of his own negligence. It also mentions whether the freight is paid or to be paid and whether the goods are insured. No consignment note should be issued unless the consignment is physically available. Non-scheduled goods are to be booked under owner's risk and all scheduled consignments are booked under carrier's risk.

(b) Trip Sheet: It is also called as lorry challan, goods dispatch memo or haulage contract. It is the contract between the booking agent and the truck owner. It mentions the number of articles, their description, weight the lorry hire or freight charges. It also gives the terms and conditions in respect of the liabilities of other parties in the event of loss or damage to the goods carried by the owner.

(c) Two copies of invoice giving details of full address of the consignee and the C.S.T. (Central Sales Tax) number and local tax number.

(d) If the consignment is to be exempted from octroy, exemption certificate should be obtained in advance from the consignor.

(e) When consignment is booked to stations where specific rules and regulations are imposed by the authority, necessary certificates should be obtained from the consignor in advance.

(f) For household articles and free medicine samples, there should be a declaration from the party stating that the consignment is meant for free distribution and not sale.

Q.No. 5.c . What is Unladen Weight?

Ans:

Unladen Weight : means the weight of a vehicle or trailer including all equipment ordinarily used with the vehicle or trailer when working, but excluding the weight of a driver or attendant, and where alternative parts or bodies are used the unladen weight of the vehicle means the weight of the vehicle with the heaviest such alternative part or body.

Weight : means the total weight transmitted for the time being by the wheels of a vehicle to the surface on which the vehicle rests.

Q.No. 6. a. Differentiate between State Transport & Private Bus services.

Ans:

State Transport Undertakings : means any undertaking providing road transport service, where such undertaking is carried on by

(a) Central government or state government.

(b) Any road transport corporation established under section 3 of the Road Transport Corporations Act, 1950.

(c) Any municipality or any corporation or company owned or controlled by the central government or one or more state government.

. Private Service Vehicle : means a motor vehicle constructed or adapted to carry more than six persons excluding the driver and ordinarily used by or on behalf of the owner of such

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vehicle for the purpose of carrying persons for, or in connection with, his trade or business otherwise than for hire or reward but does not include a motor vehicle used for public purposes.

. Public Service Vehicle : means any motor vehicle use or adapted to be used for the carriage of passengers for hire or reward, and includes a maxi-cab, a motor- cab, contract carriage, and stage carriage.

Q.No. 6.b. What different types of insurance cover are available for a motor vehicle ? Discuss them briefly. Can you drive a vehicle without an insurance cover? Why?

Ans: Third party policy

The term 'third party' comes from the operational terms of insurance contract or policy in which, the Company is referred as *first party* and the Insured as *second party*, and also signifies any person (other than the insured) involved in an accident, including passengers in the insured's vehicle as *third party*.

This covers the risk or damages caused to the third person. Personal injuries and personal vehicle damages will not be covered by this policy. For two wheeler vehicles we can take this policy for life time. For other vehicles this policy has to be renewed annually. This is the cheapest available motor vehicle insurance policy. This policy can be renewed two months in advance of its expiry.

Comprehensive policy

Briefly, comprehensive insurance means that in addition to third party, fire, and theft, cover is provided against damage to the insured's vehicle, including damage involving frost damage, but not including mechanical breakdown. The extent of comprehensive insurance may vary in detail from company to company.

This is the costly policy. It covers both personal and third party risk. We have to renew this policy annually, and it can be renewed two months in advance anywhere in India. Insurance of motor vehicles is in fact a social legislation introduced for the benefit of the general public, who are injured or due in a mo accident or whose property gets damaged in the accident.

The Government has set up a policy to compensate the losses of life, or loss of the vehicle or damage to the vehicle due to accidents, called as the insurance. Insurance is compulsory in respect of all motor vehicles. Insurance is of two kinds I.e. CompflsiVe and Third Party risk.

comprehensive Insurance is for compensating the owner in respect of all losses incur4by him during an accident, including the damage of his vehicle,

whereas the third party risk insurance is only intended to compensate the damage or loss suffered by the third party such as a pedestrih suffers injuries or death and also damage to the property of such third party caused by the accident.

Q.No. 7. Write short notes on:(ANY FOUR)

(A) STA & RTA

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The state government shall, by notification in the official Gazette, constitute for the state a State Transport Authority (STA) to exercise and discharge the powers and functions specified, and shall in like manner constitute Regional Transport Authority (RTA) to exercise and discharge throughout such areas as may be specified in the notification, in respect of each Regional Transport Authority; the powers and functions conferred by or under such authorities.

State Transport Authority (STA)

Constitution of STA:

Chairman Transport Secretary

Member Transport Commissioner

Member Additional D.G. (Police)

Member Two Non-government representatives

Member-Secretary Joint Transport Commissioner

Important Functions of STA:

1. To give effect to the directions issued under section 67 to control road transport the state government throughout the state.
2. To co-ordinate and regulate the activities and policies of the Regional Transport Authorities.
3. To settle all disputes and decide the matters where RTAs have difference of opinion.
4. To conduct not less than two meetings in a year.

Regional Transport Authority (RTA)

Constitution of RTA:

Chairman Divisional Commissioner

Member Special I.G (Police)

Member One Non-government representative

Member-Secretary Regional Transport Officer

Important Functions of RTA:

1. To decide the policies to control road transport as per the directives of STA throughout the region.
2. To fix the fares for the auto-rickshaws, taxis etc. from time to time throughout the region.
3. To conduct not less than six meetings in a year and do the business regarding control of road transport.

Q.No. 7.b ISO systems and EURO Norms.

Ans:

Euro Norms:

They are the norms for regulating vehicular emissions in Europe. The norms are expressed in terms of the weight of the pollutants such as carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (Nox) and particulate matters (PM) emitted per kilometre of vehicular run. These ceilings have been fixed for various categories of vehicles, for instance, there are particular emission levels for petrol driven and diesel driven vehicles. The Euro — I norms should have been applicable from the year 2000, and Euro — II from *Emission control*. The environment is a major area of concern, today, the world over. The problem has attracted attention in India too, as is evident from the concern voiced by the public, and the recent Supreme Court judgments. The air quality has indisputably deteriorated with toxic substances from many sources like industry, automobiles and refrigeration air-conditioning equipment, to name a few. All combine to lead the human race towards environmental disasters like acid rain, photo chemical smog, ozone layer depletion and other ecological imbalances.

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Humans are the immediate victims - from headache, dizziness, eye irritation, to brain damage, respiratory problems, cancer, kidney damage and cardiovascular deaths. The power that propels automobiles comes from combustion in the combustion chamber. That is where fuel (hydrocarbons) meets air. Ideally, oxygen in the air converts all the hydrogen in the fuel into water and all the fuel into carbon dioxide. But, in reality, combustion also produces unburned hydrocarbons, oxides of nitrogen, carbon monoxide and water.

First steps to control emission:

The first ever step to control emissions was taken in California in 1964, by specifying minimum emission system control systems on cars on 1966 model cars. In 1970, the US Congress adopted the first major Clean Air Act and established the US Environmental Protection Agency (EPA). In the same year, emission control norms were being set up in Europe and Japan. The subsequent two decades norms became more comprehensive, the implementation procedure got fine-tuned and the structural framework created.

The current decade has seen these norms being tightened, and also the adoption of a long-term agenda. Europe introduced the Euro series of norms.

India and Euro Norms:

Emissions from ECVs, LEVs and ULEVs

The first piece of legislation in India was the Air Pollution Act in 1991. The permissible level of gaseous automobile exhaust emissions was tightened in 1996. India follows the European pattern for the emission norms. For commercial vehicles with diesel engines, the norms are based on the European legislation.

The Indian government has set up April 1, 2000 as the date to implement the next set of emission standards that will apply for all the vehicles manufactured on or after that date.

Q.No. 7.c Motor vehicle registration mark system in India.

Motor Vehicle Registration Mark System in India

In India, the registration of auto vehicles is done region wise. For this purpose there are a total 32 regions. Each region covers 'a State' or an 'Union Territory'. The registration number starts with two English alphabets which signifies different regions. To elaborate it is "UP" for Uttar Pradesh, "AP" for Andhra Pradesh, "MH" for Maharashtra etc. Each region is then classified into various sub-regions, which indicates the district or its towns at which the vehicle is registered. To illustrate we take two examples, one of MH 01 and other MH 28. Both registration numbers fall in the purview of MH region but the numbers 01 and 28 represent a district and part of a district respectively. Here 01 stands for Taddev and 28 for Buldhana. After allocating the above classified code numbers, each vehicle is allotted a *numerical* number. It can be 0001, 5434, 9999 (not exceeding four figures) etc. This individual numbering starts from 0001 to 9999. Thus the complete registration number of a vehicle may be MH 10 3010.

Q.No. 7d Global positioning system.

To reduce the accidents on the roads, different measures are employed like traffic signals, one way traffics, traffic polices, traffics sign boards etc. In advanced computer age the various computer controlled systems are being used for controlling the traffic on the roads. The various systems like satellite communication for getting the proper identification of vehicles in a particular place, measuring the vehicle speed and thus controlling the over speed riding etc.

To reduce traffic conjunction car navigation system is very common in many of countries. In India this navigation systems is being introduced by few companies like Alpine Car

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Navigation. In this age of ever more complex road systems and increasingly heavy traffic, it is not always easy to stay on course. Road maps are all but obsolete. What we need today are innovative solutions. Solutions that make easier for driver by automatically selecting the right route and guiding the vehicle reliably to the desired destination. You will know where exactly you are and where you are heading, because the car navigation system operates GPS (Global Positioning system) with a digital road map holds all the information the system needs to show you the way.

Q.No. 7e Working of MSRTC.

Maharashtra State Road Transport Corporation (MSRTC)

Maharashtra has an efficient network of all weather roads and railways. Most of the cities are connected by air through Government or privately owned airlines/air taxis. The total road length in Maharashtra is approximately 246,000 km, in a total land area of about 308,000 sq. km. This works out to almost 80 km of road length per 100 sq. km of area. Maharashtra State Road Transport Corporation ply buses that connect almost all the towns and villages of the state. In addition, the cities have private and non-private taxis and auto rickshaws.

Started on 6th June 1948, initially MSRTC owns only 35 vehicles, which increases as on 16,000 vehicles in 1999. It has total around 1,16,000 staffs engaged working near about 13,651 schedules, running their buses on 19,793 margs. Through MSRTC buses approx. 75,00,000 passengers travel throughout the state per day. It has 233 depots.

It employs the three tire systems for maintaining their buses as Central Workshop, Divisional Workshop and Depots. Central workshops are at Aurangabad, Mumbai, Pune (Covering Pune, Sangli, Satara, Koihapur etc.), Ahmednagar and Nasik. The work distribution at different levels is as follows

Central Workshop:

1. Reconditioning of engine, gear box and crown wheel pinion.
2. Reconditioning of fuel injection components.
3. Work pertaining to major accidents.
4. Work pertaining to retrieval of spare parts.
5. Body Building.
6. Tire retreading.

• Divisional Workshop:

1. Top overhaul.
- 2. Reconditioning of dynamo, self-starter, voltage regulators, air compressor, water pump, brake units, radiators and transmission units except crown wheel pinion and gear box.
- 3. Periodical road worthiness inspection.
4. Work pertaining to minor accidents, body repairs and major scheduled dockings.

Depots:

1. Washing, cleaning, oil change, servicing and minor docking.
2. Running repairs.
3. Replacement of all major and minor units and assemblies.