Экзаменационные тексты.

Bearings.

Plain bearings are usually employed for the crankshaft, as they are simple, small and silent in operation. Petrol engine bearings are most often bushed with white metal (composition, a Babbitt) shells. Babbitt alloys are **at** their best with a content of 86 to 89% of tin. A valuable property of such alloys is the embedding of foreign hard matter brought by oil with resulting protection of trie journal surface.

With the use of lead-bronze for bearing material, the journal, must be hardened in order to prevent a rapid rate of wear. Foreign matter is not easily embedded in lead-bronze and efficient means of oil filtration must be provided.

Aluminium bearings have suitable frictional properties and are used either as fufl bushes or cast onto a steel shell. The high heat conductivity of aluminium assists the removal of heat from the bearing. The requisites for aluminium bearings are a hard journal and clean oil. Abrasive foreign matter is absorbed by aluminium better than by bronze.

Silver bearings have excellent characteristics and withstand high loads. They are preferred for big end bearings in radial engines. They are excellent in respect, of fatigue resistance and freedom from corrosion and their high heat conductivity is valuable. .-

Rolling bearings reduce friction and increase mechanical efficiency. They do not require the same degree of lubrication as plain bearings, but they are noisier in operation. Owing to smaller factional loss, oil temperature is kept lower, so that the necessity for oil cooler is sometimes obviated, A built-up crankshaft is however necessitated.by the use of rolling bearings and this is more costly. In motor-cycle engines which use built-up crankshafts and one-piece connecting rods, big end rolling bearings are convenient.

Public transport.

Buses were started in Paris in 1820. In 1828 they we introduced in London by George Shillibeer, **a** coach build' who used the French name "Omnibus" which was obtained from the Latin word meaning "for all". His omnibuses were driven by three horses and had seats for 22 passengers. The in the 20th century reliable petrol engines became available, and by **1**912 the new motor buses were fast replacing horse-driven buses.

Trams were introduced in the middle of the 19th century. The idea was that, as the rails were smoother than the roads, less effort was needed to pull **a** tram than a bus. The first trams were horse drawn but the later trams were almost al driven by electricity. The electric motor driving the tram was usually with electric current from overhead wires. Sue wires are also used by trolley-buses, which run on rubber tyres and do not need rails.

Another form of transport used in London, Paris, Berlin, Moscow, Leningrad, Kiev and some other crowded cities is the underground railway.

London's first underground railway of the "tube" type was opened in 1863. The Moscow underground which is considered to be the best and most comfortable underground in the world, was opened in 1935

Diesel Engines.

Diesel engines have the charge of oil for each power stroke delivered, to the cylinder under high pressure at the required moment, and the only controls of speed and power are the regulation of the quantity of oil at each injection, and of the moment of commencement of injection. If *a* single-cylinder engine of about 4 or 5 in. cylinder bore runs, at 2,000 r,p.m., a spot of oil less than the size of a grain of rice'- must be injected at an exact moment in the .cycle of operations 1,-000 times a minute, # while when the engine is ticking over at 300 r.p.m. the size of each charge injected 'will be smaller than the head of a very small pin. Between these limits the pump delivery must[1] be capable of infinite variations and when a multi-cylinder is involved each cylinder must nave an exactly equal charge for any setting.

The function of the injection apparatus is not only to deliver extremely small and accurately metered quan tities of fuel into the cylinder, but to assist in breaking, the oil up into uniform particles of the smallest possible size and distributing them throughout the combustion chamber. The fuel must not be injected all at once, but over a period, commencing just before the piston 'reaches top dead centre .on the compression stroke and ending after it has passed .top dead centre, the duration of the injection period corresponding to about one-tenth of a revolution of the crankshaft. Obviously the pressure exterted by the pump must be much greater than the initial combustion pressure in order that the fuel shall issue from the injection nozzle in a fine spray capable of penetrating the compressed air in the combustion space.

During the injection, period the atomized fuel must be evenly distributed throughout the air in the combustion space, and so there is the use of high injection pressure, multi-hole sprayers and small injection orifices on the one hand, in conjunction with cylinder-head, valve-port and piston-crown designs to promote air swirl, and turbulence on the other.

Hybrid Japanese Electric Vehicles

Hybrid electric vehicles have been developed by auto manufacturers independently, as a promising option for replacing internal combustion engine vehicles. To date, several hybrid buses and passenger car have been commercialized.

In 1997, Toyota Motor Corporation launched its originally designed production hybrid passenger car Prius. The price is 2.15 million yen, only 25 percent higher than a comparable gasoline vehicle. The Prius is powered by both gasoline engine and electric motor independently or jointly, doubling the fuel efficiency to 28 km per liter compared with a conventional Corolla. The company developed hybrid system combines parallel and series hybrid systems, allowing the engine simultaneously to provide propulsion and to operate an electric generator charging the nickel-metal hydride batteries with a power split device. The vehicle also achieved lower emissions, half of carbon dioxide and one tenth of nitrogen oxides compared to a gasoline car.

Nissan Motor's hybrid electric vehicle will use series hybrid system comprising a newly developed compact electric motor, lithium-ion batteries, and a gasoline engine which is solely used to generate electricity. The vehicle can cover 660 km, and runs 50 km on pure electric drive. The company claims that its hybrid system doubles fuel efficiency, and reduces nitrogen oxide, hydrocarbon and carbon monoxide by 95%, and carbon dioxide 50% comparing with a gasoline version.

Public interest in the electric vehicle has become higher and higher, to which the latest electric vehicles can respond in terms of performance, pleasure of driving, fuel efficiency, as well as zero emissions and low noise. The second-generation electric vehicles powered by long-life batteries also have far less running costs than conventional vehicles. These vehicles may hold the key to electric vehicle

market expansion for the coming several years. Further improvement in vehicle performance, however, is indispensable especially for K class* mini vans and trucks, for these are the major vehicles to have been and to be introduced by the major users such as municipalities and utility companies.

Steam Engines.

In the West the first steam carriage was invented in France. The three-wheeled machine had the front wheel driven by a two-cylinder steam engine, and carried two people along the road at a walking pace. It was not a great success, as the boiler did not produce enough steam for keeping the carriage going for more than about 15' minutes.

The steam engine appeared in 1763. It was followed by several improved steam road carriages. Their further development was prevented by railway companies. The rapid spread of railways in the United Kingdom was due largely to George Stephenson, who was an enthusiast as well as a brilliant engineer.

He demonstrated a locomotive that could run eighteen kilometres an hour and carry passengers cheaper than horses carry them. Eleven years later Stephenson was operating a railway between Stockton and Darlington. The steam locomotive was a success.

In Russia the tsar's government showed little interest in railway transportation. After long debates the government, which did not believe in its own engineers, finally decided to invite foreign engineers to submit (представить) projects for building railways in Russia.

Motor Cars.

Like most other great human achievements, the motor car is not the product of any single inventor. Gradually the development of vehicles driven by internal combustion engine — cars, as they had come to be known, led to the abolition of earlier restrictions. Huge capital began to flow into the automobile industry.

From 1908 to 1924 the number of cars in the world rose from 200 thousand to 20 million; by 19G0 it had reached 60 million! Ko other industry had ever developed at such a rate.

The rapid development of the internal combustion engine led to its use in the farm tractors, thereby creating a revolution in agriculture. The use of motor vehicles for carrying heavy loads, developed more slowly until the 1930s when diesel-engined lorries became general.

The motor cycle steadily increased in popularity as engines and tyres became more reliable and roads improved. Motor cycles were found well suited for competition races and sporting events and were also recognized as the cheapest form of fast transport.

Motor cycles

Modern motor cycles also are designed almost exclusively with air-cooled engines; with them, as with aircraft, sufficient cooling air is provided by the flow due to the motion of the vehicle, and no special cooling fans are required. Air-cooled motor-cycle engines have hjgh specific performances, and they are equal to the best water-cooled engines. New desingns of air-cooled vehicle engines are notable for their easy maintenance, reliability, and economical operation.

In the internal combustion engine only one third of the heat energy contained in the fuel is converted into work, one third is lost in the exhaust gases, and one third is carried off by cooling. This distribution of available energy is approximate only, the exact relation depends on specific factors such as engine design, type of fuel, cooling system, etc. Heat carried off by cooling must be considered as a definite loss, because apart from the fact that no useful work can be obtained from it, part of the engine performance is frequently used for its removal. Therefore, every endeavour must be made to keep this loss of heat energy at a minimum.

Cooling of the engine is necessary for the following reasons. The maximum temperature of the cylinder wall is determined by lubricating conditions. After a certain temperature has been reached lubricating conditions begin to deteriorate rapidly, and increased wear, or even seizure of pistons and piston rings,- are likely to occur. The maximum permissible temperature depends upon the quality of the lubricating oils; it ranges from !60°C to 200°C.'

Strength of conventional materials limits the temperature of cylinder heads to approximately 220°C— 260°C. Cylinder heads of air-cooled engines are usually produced of light alloys whose strength decrease rapidly at temperatures above 200°C. Additionally, if the temperature of the cylinder head is excessive the inducted

SPECIFICATIONS AND CHARACTERISTICS

The JSC UA manufactures the two-axle all-wheel drive cross-country vehicles with the front and rear driving axles (4x4 wheel arrangement) which are designed for transportation of cargoes and passengers on roads of all types as well as off-the-road. The automobiles equipped with a towing gear with a resilient element can tow a single-axle trailer with a gross mass of 850 kg. Separate automobiles may be equipped with a rigid towing gear allowing a short-time operation with a trailer.

UAZ-31512 - a passenger/cargo {Fig. 1a) vehicle with soft open-top four-door multi-purpose body and tail gate, with single-stage driving axles*.

UAZ-3741 -a van (Fig. 1b) with all-metal closed wagon-type body divided by a partition into a driver's cab and a cargo compartment; the automobile is designed for transportation of cargoes which are loaded and unloaded through the side and rear double-swing doors.

UAZ-3962-an ambulance (Fig. 1c) with all-metal closed wagon-type body divided by a partition into a driver's cab and a sanitary compartment with the side and rear double-swing doors.

UAZ-2206-a bus(Fig. 1 d) with all-metal closed wagon-

type body; the automobile is designed for transportation of passengers; passengers board the bus through the side door of the passenger compartment.

UAZ-3303 - a cargo vehicle (Fig. 1 e) with all-metal two-seat cab and a wooden platform with three flaps.

UAZ-31414-differs from UAZ-31512 in hard top and the cargo compartment cover.

UAZ-31512-10 and UAZ-31514-10 differ from the base designs in front spring suspension and rear suspension with small-leaf springs.

UAZ-3909 - a passenger/cargo vehicle with all-met^l wagon-type body divided by a partition into a passengerand a cargo compartments.

UAZ-39091 (Fig. 1f) has an all-metal 5-seats cab with three side single-swing doors and a metal or wooden platform with a removable tent or without it.

The JSC UAZ manufactures other modificattons, designs which differ in various combination of the above mentioned signs and of the design signs,and also in various extent of comfort.

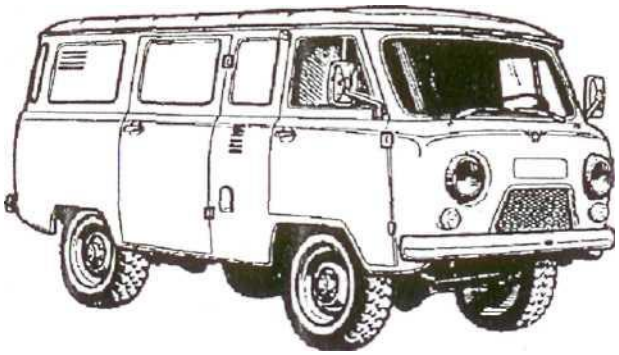

Fig. 1 a. Automobile UAZ-31512
Fig. 1 b. Automobile UAZ-3741