MODEL ANSWER

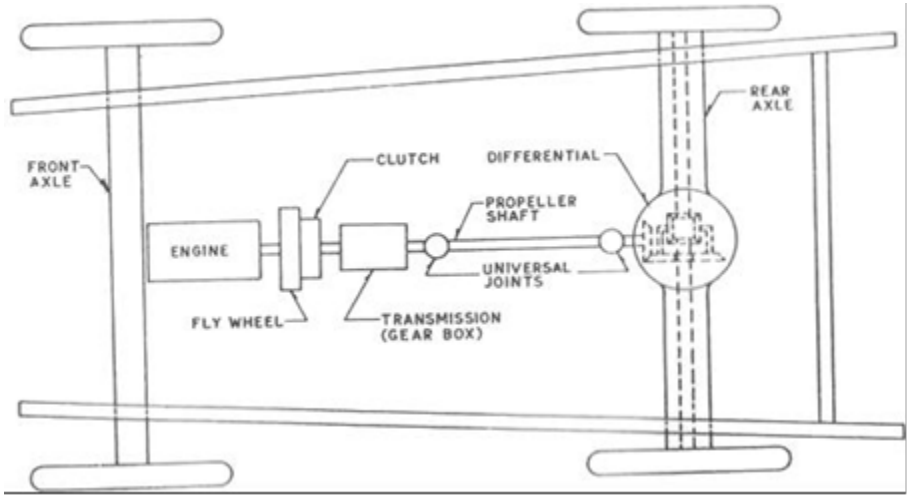
Winter – 18 EXAMINATION

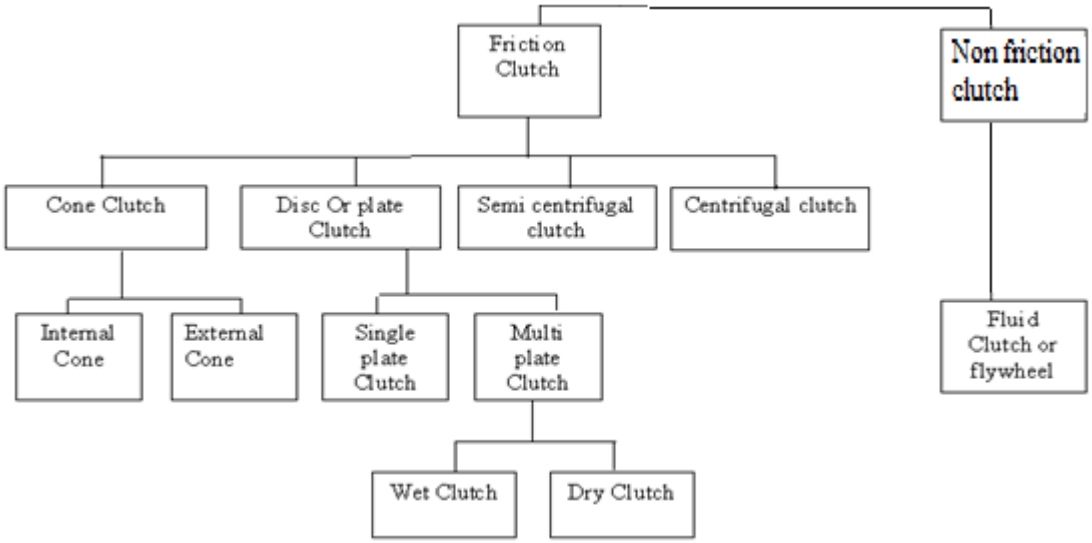
Subject Title: Vehicle Layout & transmission System Subject 17307

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		Attempt **any Six**	12
	a)	**List main components of an automobile**	**02**
		Engine, Clutch, Gearbox, propeller shaft, Differential, final drive, wheels, tyres, suspension system ,braking system etc.	
	b)	**Name then type of clutch used in two wheelers and four wheeler vehicles**	**02**
		Two wheeler:- Multi plate wet type Four Wheeler:- Single plate diaphragm type, Single plate coil spring type	
	c)	**Why helical gears are used in transmission?**	**02**
		-In helical gears 2 to 3 teeth of gears mesh with each other as compared to 1 or 2 teeth of spur gears which increase power transmission capacity -quiter in operation as compare to spur gear which produce noise while transmission	
	d)	**Name any two vehicles in which synchromesh gearbox is used.**	**02**
		Sport cars, Sport utility vehicle, cars etc	
	e)	**List two basic types of constant velocity joints**	**02**

		Rzeppa type, Tripod type	
	f)	**Write main components of differential assembly.**	**02**
		Bevel pinion, crown wheel, cage, sun & planet gears, and axles.	
	g)	**State the type of rear axles used for LMV & HMV**	**02**
		LMV- Semi floating, Three quarter HMV- Full floating type rear axle.	
	h)	**State the functions of car wheel.**	**02**
		-to carry vehicle weight -to absorb road shocks -to transmit driving thrust - carry side thrust & cornering force.	
B)		Attempt **any Two**	**08**
	a)	**Draw a layout of front engine rear wheel drive vehicle & label the details**	**04**
		(Diagram 2 marks & neat labelling 2 marks) 	
	b)	**Give the details classification of clutches**	**04**

			**04**
	c)	**Write the functions of gearbox used in automobiles. State major components of synchromesh gearbox.**	**04**
		Function:- 1. To vary torque & speed as per requirement. 2. To reverse the vehicle 3. Control the speed of vehicle. 4. To start engine when battery get discharged. 5. It act as parking braking in stationary condition of vehicle and gears are in engaged position **Major components of synchromesh gearbox** 1) Clutch shaft 2) lay shaft 3) Main shaft 4) Clutch shaft gear, Lay shaft Gear, Main shaft Gear, idler gear 5) Synchronizer	**02** **02**

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Q. No.	Sub Q. N.	Answer	Marking Scheme
2		Attempt **any Four**	16
	a)	**What are the different loads acting on a frame**	**04**
		The various loads acting on the rear axle are-(Any 04 points each carry 01 mark) 1) **Driving thrust**-Driving torque produced in the engine causes the thrust to be produced in the road wheels, which has to be transmitted from the axle casing to the chassis frame and the body of the vehicle. 2) **Torque Reaction-**If the rear axle is held rigidly when the road wheels are prevented from rotation, (due to driving needs or road conditions) the bevel pinion of the final drive tends to rotate around the crown wheel. It produces a tendency in the whole vehicle to rotate about the rear axle, or to lift off the front of the vehicle. This effect is known as torque –reaction. 3) **Braking torque or thrust-**The axle casing experiences the brake torque when the brakes are applied to the vehicle. 4) **Side thrust**-When the vehicle is taking the turn, the rear axle subjected to the side thrust or pulls due to any side load on the wheel. 5) **Weight of the body**-The rear axle may be considered a beam supported at ends loaded. This weight causes bending and shears force in the axle shaft	
	b)	**State any two advantages & two disadvantages of frameless construction**	**04**
		Advantages: 1. Substantial weight reduction, which is possible when using a well-designed unitized body 2. Lower cargo floor and vehicle height 3. Protection from mud and water required for drive line components on amphibious vehicles 4. Reduction in the amount of vibration present in the vehicle structure **Disadvantages:-** 1. High maintenance cost in case of accident 2. Low load carrying capacity.	**02** **02**
	c)	**List types of frame sections, draw their sketches and write significance of each**	**04**
		four section of chassis frame with their merits (1 marks to each)	

Channel Box Tubular I-section

Figure: Frame sections

Channel Section: The channel section is used for making the long members of the frame. It provides a good resistance to bending. It is poor in torsion. This type of section is used in conventional ladder like frames of LMV (e.g. Mahindra Jeep) and HMV (e.g. Truck, Bus etc). **Box section:** Box section is good for both bending and torsion. The cross member of conventional frame are made of box sections. This type of frame section is used in frames of motorcycles (e.g. Bajaj Pulsar, Boxer etc.)

Tubular sections: Tubular sections provide good resistance to torsion but poor resistance to bending. Now a days, tubular section is used to make complete chassis frame of three wheeler, scooter, motorcycle, matador and pickup van etc

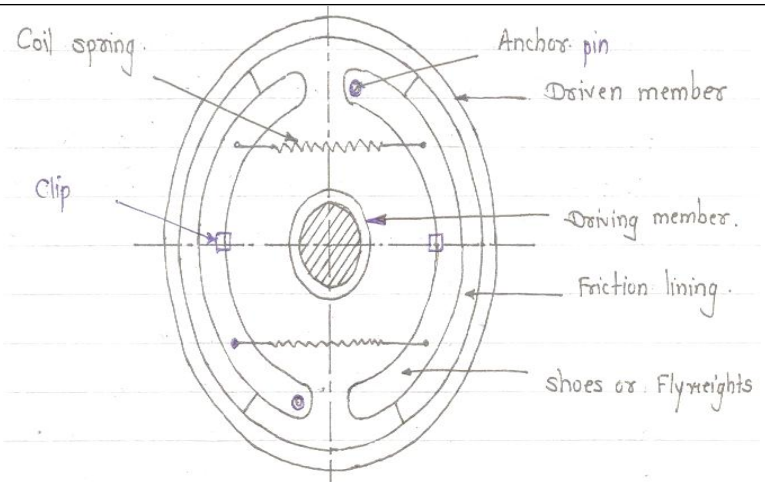
I-Section: I- section is used for making cross members. I-Section has high moment of inertia and stiffness which makes it resistant to bending moments. The web provides resistance against shear forces. These sections are not resistant to torsional loading (twisting) and they shall not use in the cases where torsion is dominant

d) List different materials used for a clutch lining & state their coefficient of friction **04**

Material:-
1. Leather
2. Cork
3. Fabric
4. Asbestos
5. Reybestos and Ferodo
6. Non- asbestos clutch lining material

e) Differentiate between single plate & multi plate clutch (any 4) **04**

	Single plate clutch	Multi plate clutch
1	It consist of only 1 Clutch plate	It consist of 2 or more no. of clutch plate
2	No. of pair of friction surfaces are 2	No. of friction surfaces in contact n+1 (where ,n=no. of clutch plate)
3	Required more space	Required less space.
4	For same power transmission larger size required	For same power transmission smaller size required
5	For same size power transmission capacity is less	For same size power transmission capacity is more
6	Frictional power losses are less	Frictional power losses are more

		7	Application:-LMV ,car jeep tempo etc	Application:-Motorcycle, sport cars, in some HMV	
	f)	**Describe working of centrifugal clutch with a neat sketch**		**04**
				**02**
		Fig:- Centrifugal Clutch		
		Working of Centrifugal Clutch: Centrifugal clutch works on the principle of centrifugal force. When the engine is started, the speed of the driving shaft is less, so the centrifugal force is also less. Therefore, shoes (flyweights) do not move outwards and torque is not transmitted to the rear wheel. As the speed of engine increases, the centrifugal force also increases. At certain engine speed, the shoes fly off outwards due to increased centrifugal force and they come in contact with the driven member. Now both the driving and driven members rotate together and the clutch is said to be engaged. Thus the engine torque is transmitted to the rear wheel. When the engine speed decreases, the centrifugal force also decreases. Now the shoes return back to their original position due to spring force which results in a disengagement of the clutch and torque is not transmitted to rear wheel.		**02**

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Q. No.	Sub Q. N.	Answer	Marking Scheme
3		Attempt **any Four**	16
	a)	**Compare dry plate clutch with wet Plate clutch**	**04**
		(1 marks each point)	

Parameter	Dry Clutch	Wet Clutch
Construction	When the clutch is operated dry i.e. without oil, it is called as a dry clutch.	When the clutch is operated in an oil bath, it is called as wet clutch. In this, clutch plates are always wetted by oil circula
Torque	Torque transmission capacity is higher.	Torque transmission capacity is lower (35-50% of dry clutch), since the clutch plates are wetted by oil
heat dissipation	due to metal and air contact heat dissipation is fair	Due to metal and oil contact heat dissipation is much better.
Application	Single plate dry clutch is used in light motor vehicles for e.g. Jeep, Car, Bus, Truck etc.	Multi-plate clutch is used in motor cycles, racing cars, heavy duty vehicles.

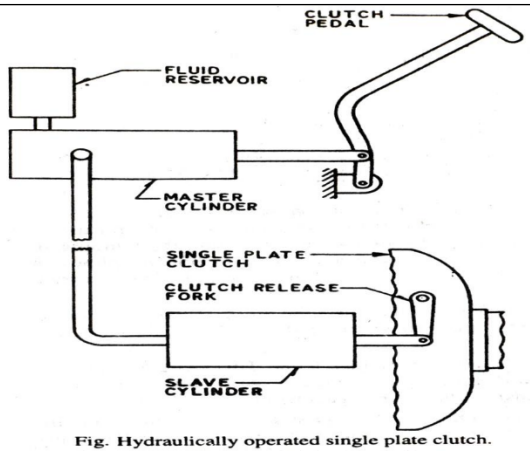
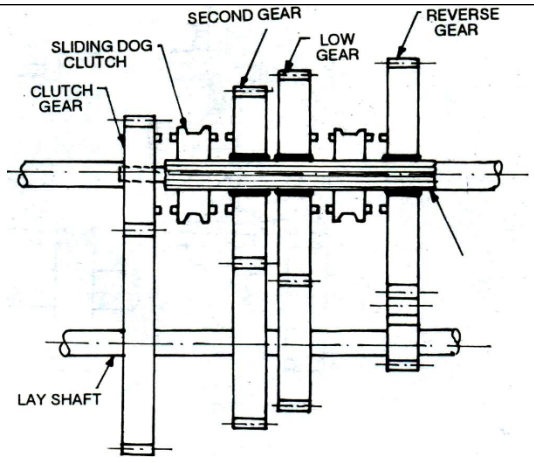
	b)	**Describe hydraulic type of clutch operating mechanism & write its advantages.**	**04**
		 Fig. Hydraulically operated single plate clutch.	

Fig:- Hydraulic Clutch Linkage

A hydraulically operated clutch mechanism is shown in the figure. The mechanism

		consists of master and slave cylinders. The cylinders are connected by hydraulic lines. When the clutch pedal is pressed the fluid under pressure from the master cylinder reaches the slave cylinder which is mounted on the clutch itself. The fluid under pressure actuates the slave cylinder push rod which further operates the clutch release fork to disengage the clutch. In India, this type of clutch has been used in Standard 20, Swaraj Mazda and Eicher Mitsubishi's vehicles **Advantages:-** 1. Less effort required operate clutch 2. Smooth operation.	
	c)	**Why clutch is necessary device in automobile transmission system?**	**04**
		1. To engage and disengage the engine power from transmission as required when the vehicle is to stop by applying brakes. 2. To facilitate the easy gear shifting from 1st to 2nd or from top to 1st gear whenever required by disconnecting the engine from transmission. 3. To reduce the noise in transmission by providing suitable means. 4. To reduce the vibrations during high speed power transmission.	
	d)	**Describe with schematic sketch working of constant mesh gearbox.**	**04**
		 **Fig:-** Constantmesh Gearbox -In constantmesh gearbox all the gears on the mainshaft are constantly mesh with layshaft gear & freely rotate on mainshaft. -When the clutch is in engaed position & gears are netral position & engine is running an additional part called “Dog clutch”is provide between mainshaft gears slide on splined shftb with help of selector mechanism. -a whole assembly enclosed in the gearbox hausing and filled with specific grade oil in specific quantity **Working:-** **Neutral Gear:-**in neutral stage all dog clutches remains at centre position and no power transmit throgh gearbox. **1st Gear:-**As the right side dog clutch slide towards left and its teeth mesh with teeth of first gear on mainshft than first gear ratio obtained which is near about 3:1 **2nd Gear:-** When left side dog clutch slide towards right side and its teeth mesh with teeth of second gear on mainshft than second gear ratio obtained which is near about 2.5:1	**02** **01**

		3rd Gear or Top gear:- :- When left side dog clutch slide towards left side and its teeth mesh with teeth of clutch shaft gear than third gear ratio obtained which is near about 1:1 **Reverse Gear:-** As the right side dog clutch slide towards right side and its teeth mesh with teeth of reverse gear on mainshft than direction of mainshaft becomes reverse & reverse gear ratio obtained which is near about 3:1	**01**
	e)	**Write any two advantages of constant mesh gearbox; also state any two disadvantages of sliding mesh gearbox.**	**04**
		Advantages of constant mesh gearbox(any2) 1. In constant mesh gears on main shaft are constantly mesh lay shaft gears desired gear ratio can be obtained by sliding & meshing dog clutch with main shaft gear which is quite simple than sliding mesh gearbox 2. In constant mesh gearbox helical gears are used which are smoother in operation & reduce noise as compare to spur gear in sliding mesh gearbox. 3. Rate of wearing of dog clutch is less as compare to spur gear in sliding mesh gearbox. 4. Power transmission capacity of helical gears is more as compare to spur gear used in sliding mesh gearbox **Disadvantages of Sliding mesh gearbox(any2)** 1. More effort required to shift gear. 2. Noisy operation due spur gears. 3. Skill driver required. 4. Low mechanical effort.	**02** **02**
	f)	**Explain how the lubrication of an automobile gearbox is done**	**04**
		Different lubrication points of gear box: 1. The gear box should always remain filled with lubricant. The gears are partially dipped in lubricating oil 2. It lubricates bearing of the gear box 3. Selector mechanism is lubricated by thin machine oil/engine oil. **Lubrication of gear box** Proper lubrication of gear box is extremely important. The transmission gears operate in a bath of lubricating oil to prevent metal-to-metal contact. Lubrication of gear box is done by putting oil of specification given by the manufacturer (the gear oil is thicker than the engine oil), in the gear box to ensure that at least one gear dips in the oil. With the clutch engaged the gears will rotate and splash the oil. The bearings located in transmission case are lubricated with grease periodically as and when it is required. Different design of the gear boxes has different requirements. Some car makers recommend engine oil for gear boxes, with overdrive. Synchromesh gear box and some overdrive units require fluid gear oil of SAE 80 and 90 viscosity. The lubricant level in the gear box should be inspected every 1000 miles and filled if necessary. If the lubricant should be contaminated, the gear box should be drained, flushed and refilled with fresh lubricant.	

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Q. No.	Sub Q. N.	Answer	Marking Scheme
4		Attempt **any Four**	**16**
	a)	**What is transfer case? Where it is used? State its function.**	**04**
		Transfer Case:- Transfer case is auxiliary gearbox in 4 wheel drive vehicle along with main gearbox its function to transmit torque & power to rear as well as front wheels. **Application**:- in four wheel drive vehicle, tractor ,JCB, Sport utility vehicle, Jeep, Military vehicle etc. **Function:-**It can enable & disable power transmission to front wheel optional as well as four wheel in Low & High gear ratio	02 01 01
	b)	**State the merits and demerits of synchromesh gear box over sliding mesh & constant mesh gear box**	**04**
		Merits of synchromesh gear box: 1) No need of double declutching as in case of constant mesh gearbox. 2) Smooth engagement of higher gears due to synchromesh device. 3) Less noisy as helical gears are used. 4) Less vibration. **Demerits of synchromesh gear box:** 1) Synchromesh is a fine machined element and hence is costly. 2) Service of gears and synchromesh device is difficult. 3) More space is required. 4) Use of synchromesh device for low speed gears is uneconomical	**02** **02**
	c)	**Describe working of torque converter with neat sketch.**	**04**
		The torque converter is modified form of fluid flywheel. Torque converter is used to transmit the power with varied torque as per the requirement. It consists of following components 1. Driving member (impeller) - connected to the crankshaft, 2. Driven member (turbine) - connected to output shaft, and 3. Reaction member also (stator) - mounted on overrunning clutch on stationary component.	**01** **02**

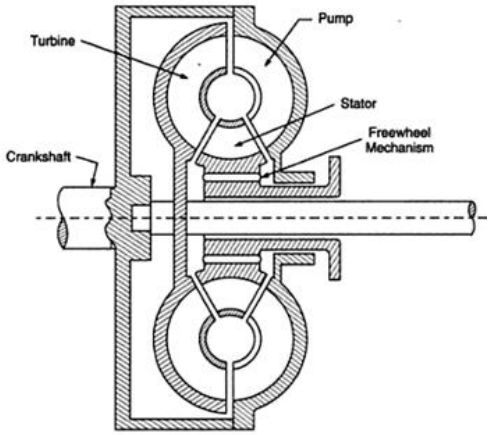

Fig:- Torque converter

01

Working

Converter starts operating when the impeller starts rotating, with the engine providing the
Required input. The impeller creates a centrifugal pumping head or vortex flow. At the same time, the fluid must follow the rotational inertia or the effort of the impeller. These two fluid forces combine to produce a resultant force in the form of an accelerated jet stream against the turbine vanes. The impeller and turbine attempts to act as an effective fluid coupling. The turbine vanes reverse the fluid direction. The curved turbine vanes provide efficient energy transfer, but the reentry of the remaining fluid thrust back to the impeller, works against the impeller and crankshaft direction. Hence, it is necessary to introduce the stator element to make the converter work. The stator is employed between the turbine, outflow and impeller inflow to reverse the direction of the fluid and make it flow in the same direction as that of the impeller. Instead of the fluid opposing the impeller, the fluid energy now assists the impeller and crankshaft rotation. This results in boosting the rpm of the impeller. This
Allows the impeller to accelerate more and recycle the fluid with a greater thrust against the turbine vanes.

	d)	**Explain with neat sketch construction of propeller shaft.**	**04**

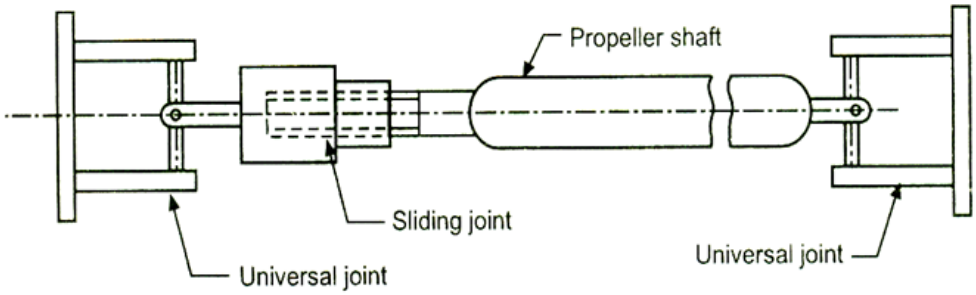

Fig:- Propeller shaft

02

Propeller Shaft

It consists mainly of three parts:
1. **Shaft:** - As the shaft has to withstand mainly torsional loads, it is usually made of tubular cross section. The shaft has to be well balanced to avoid whirling at high

		speeds. Shaft is made of steel, aluminum or composite materials 2. **Slip joint**: - Depending upon the type of the drive, one slip joint may be there in shaft. This serves to adjust the length of the propeller shaft when demanded by the rear axle movement. Slip joint is formed by the internal splines on the sleeve attached to the left universal joint and external splines on the propeller shaft as shown in figure. 3. **Universal joints**: Depending upon the type of the rear axle one or two universal joints is used. The universal joints account for the up and down movements of the rear axle when the vehicle is running	**02**
	e)	**Compare between Hotchkiss drive & torque tube drive**	**04**
		(any4) **Sr No** / **Hotchkiss Drive** / **Torque Tube Drive** **1** / Open type Propeller shaft is used / Propeller shaft is enclosed inside tube called torque tube. **2** / Two universal joints are used one at front end & other is at rear end of Propeller shaft. / Only one universal joint is used at front end of Propeller shaft. **3** / Slip joint is used to accommodate change in length of Propeller shaft. / No slip joint is used. **4** / Torque reaction, driving thrust ,side thrust, weight of body & braking torque are taken by leaf spring / Weight of body & side thrust are taken by leaf spring. Torque reaction, driving thrust & braking torque are taken by torque tube. **5** / Bracket is providing at front end of leaf spring. / Shackle is provided at both end of leaf spring. **6** / Centre axis of Propeller shaft & bevel pinion shaft is not coinciding when axle moves up & down. / Axis of Propeller shaft & bevel pinion shaft coincides always. **7** / Application:-Heavy Vehicles truck, Jeep & buses / Application:-In light motor vehicle, SUV, cars, Military vehicles **8** / Propeller shaft can be easily remove / Whole assembly of torque tube member should be remove for removing propeller shaft.	**04**
	f)	**Why hollow propeller shaft used in automobile? Give its application**	**04**
		1. It increases the inertia which would increase its acceleration & deceleration. 2. It withstands maximum bending stress as compare to solid shaft. 3. It has less weight so less chances of sagging. **Application:-** In Front Engine Rear Wheel Drive Vehicles, Rear Engine Rear Wheel Drive Vehicles, Centre Engine Rear Wheel drive vehicles & Rear Engine Front Wheel Drive Vehicles like Tempo, Trucks, Buses, Omni, Sport utility vehicles, jeep etc	**02** **02**

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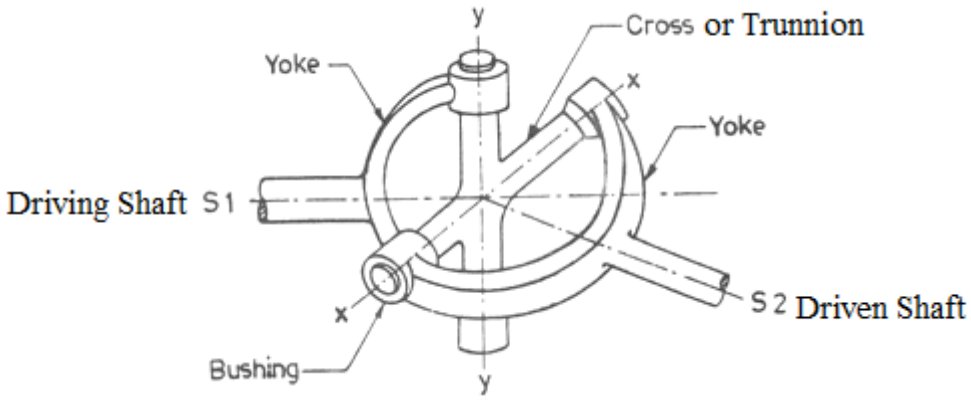
Q. No.	Sub Q. N.	Answer	Marking Scheme
5		Attempt **any Four**	16
	a)	**Draw a neat sketch of Hooks type universal joint & label the parts.**	**4**
		(neat sketch 2 Marks & labeling 2 marks)  **Fig;- Hooks type universal joint**	
	b)	**Explain with neat sketch working principle of differential**	**04**

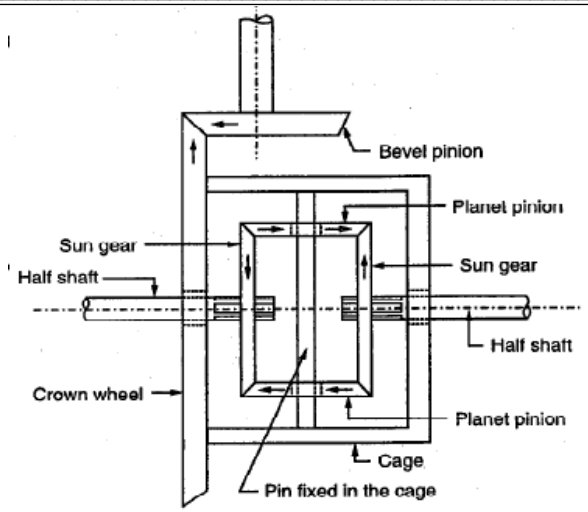


Fig:- Differential

02

Working Principle of differential:

When vehicle moves in a straight line, the power comes from propeller shaft to the bevel pinion which drives the crown wheel. Then it is carried to the differential cage in which a set of planet pinions and sun gears are located. From the sun gear it is transmitted to the road wheels through axle half shafts. In this case, the crown wheel, differential cage, planet pinions and sun gears all turn as a single unit and there is no any relative motion between the sun gear and planet pinion. The planet pinions do not rotate about their own axis. Both the road wheels turn at the same speed.

When vehicle takes a turn, the inner wheel experiences a resistance and tends to rotate in opposite direction. Due to this the planet pinions starts rotating about their own axis and around the sun gear and transmit more rotary motion to the other side sun gear. So that outer sun gear rotates faster than the inner sun gear. Therefore the outer road wheel runs faster than the inner road wheel and covers a more distance.

02

	c)	**What are the different types of loads acting on rear axle?**	4

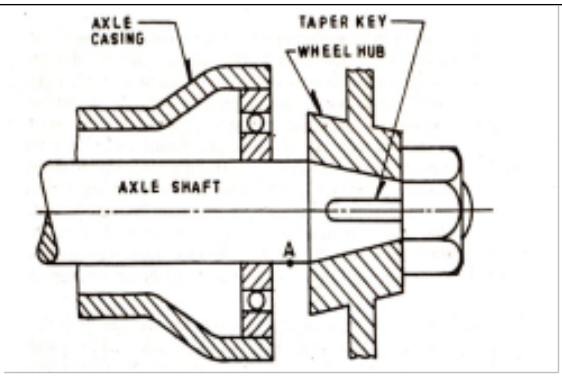
The various loads acting on the rear axle are-(Any 04 points each carry 01 mark)

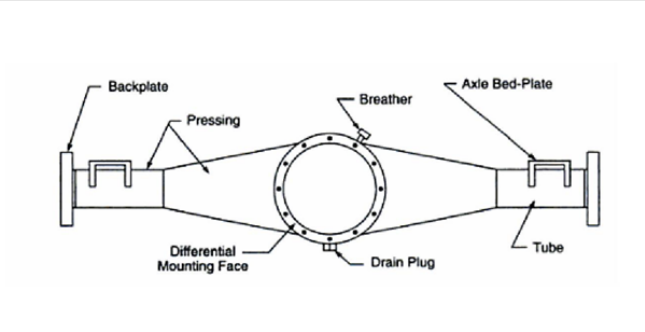
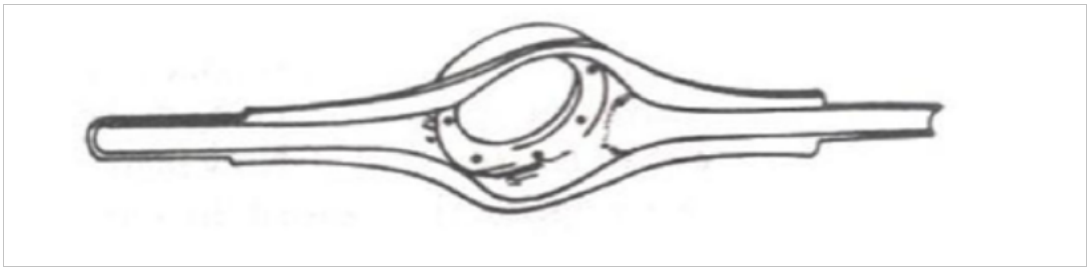
1) **Driving thrust**-Driving torque produced in the engine causes the thrust to be produced in the road wheels, which has to be transmitted from the axle casing to the chassis frame and the body of the vehicle.

2) **Torque Reaction-**If the rear axle is held rigidly when the road wheels are prevented from rotation, (due to driving needs or road conditions) the bevel pinion of the final drive tends to rotate around the crown wheel. It produces a tendency in the whole vehicle to rotate about the rear axle, or to lift off the front of the vehicle. This effect is known as torque –reaction.

3) **Braking torque or thrust-**The axle casing experiences the brake torque when the brakes are applied to the vehicle.

4) **Side thrust**-When the vehicle is taking the turn, the rear axle subjected to the side

		thrust or pulls due to any side load on the wheel. 5) **Weight of the body**-The rear axle may be considered a beam supported at ends loaded. This weight causes bending and shears force in the axle shaft.	
	d)	**Explain with neat sketch semi floating type rear axle.**	**04**
		 **Fig**:- Semi floating type rear axle **Explanation**: The figure shows a schematic diagram of the semi floating rear axle. A single ball bearing is inside the axle casing. The axle of the wheel is at the centre of the axle casing and the wheels are fitted at the end of the axle. This is done by means of key, bolt and nut. The whole weight of the vehicle is first transmitted to the suspension spring. From there it is transmitted to the axle casing from there to the axle and wheel. Finally it is transmitted to the ground. The axle can be removed by first placing a support below the axle casing	**02** **02**
	e)	**State advantages & disadvantages of fully floating type rear axle.**	**04**
		Advantages 1. Full floating type axle shaft carry only the driving torque, their failure or removal doesn't affect the wheels. But in case of semi floating this is not possible. 2. Semi floating type axle is simplest and cheapest then full floating type because of which it is widely used on cars. **Disadvantages:-** 1. Full floating is costliest as compared to semi-floating 2. Since in semi floating axle, axle shafts have to support all loads, they have to be of larger diameter for the same torque transmission as compared to full floating type	**02** **02**
	f)	**Write the functions of rear axle casing .Also state types of rear axle casing.**	**4**
		Function of rear axle casing:- **Types of rear axle** **1) Banjo type (or one piece) casing**- It is named so, because its shape like the	**02**

		musical instrument banjo. It is also called separate carrier type casing because the complete differential unit is carried in a separate carrier which is bolted to the axle casing. The two half shafts are put- in or taken-out from the sides during assembly or repairs. In majority cars the propeller shaft lies along the center line of the car, and the rear axle gearing is enclosed in banjo at the center of the axle casing. However, in certain cases the banjo may be offset to one side or the other  Fig:- Banjo type casing **2) Split (or two piece) casing**- The casing is made in two-pieces which are bolted together to form a casing. This type is obsolete now because in case of a fault, the whole rear axle unit has to be taken out before its dismantling. This type is obsolete now.  Fig:- Split casing	**01** **01**

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<table>
<tr><th>Q. No.</th><th>Sub Q. N.</th><th>Answer</th><th>Marking Scheme</th></tr>
<tr><td>6</td><td></td><td>Attempt any Four</td><td>16</td></tr>
<tr><td></td><td>a)</td><td>Comparison between Semi floating & fully floating type rear axle.</td><td>04</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Description</th><th>Semi-floating rear axle</th><th>Full floating rear axle</th></tr>
<tr><td>1) Bearing location</td><td>Single bearing between shaft and
casing.</td><td>Two bearings widely spaced between
hub and casing.</td></tr>
<tr><td>2) Size of shaft</td><td>For same torque transmission size of shaft is bigger.</td><td>For same torque transmission size of shaft is smaller.</td></tr>
<tr><td>3) Stress acting
on axle shaft</td><td>Stress acts on shafts are Torsional,
bending, shear, tension, and compression stress.</td><td>Stresses acting on shaft are Torsional stresses.</td></tr>
<tr><td>4) loads acting on axle shaft</td><td>Loads acting on axle shafts are
vehicle weight, side thrust,driving torque, and braking torque.</td><td>Loads acting on axle shafts are driving torque, and braking torque.</td></tr>
<tr><td>5) Vertical load taken</td><td>Yes, taken by the half shaft bearings.</td><td>Nil</td></tr>
<tr><td>6) Side load</td><td>Present</td><td>Nil</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>b)</td><td>State advantages & disadvantages of disc type of wheel.</td><td>04</td></tr>
<tr><td></td><td></td><td>Advantages:-
1) It is rubbished type of wheel disc
2) Low Manufacturing cost as compare to alloy wheels
3) In case of damage it can repaired easily.
Disadvantages:-
1) Weight is more as compared to alloy wheels
2) it is corrodible</td><td>02

02</td></tr>
<tr><td></td><td>c)</td><td>Differentiate between Conventional tube type tyre & Tubeless tyre</td><td>04</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Tube tyre</th><th>Tubeless tyre</th></tr>
<tr><td>1. Weight is more as it has tube and flap inside the tyre.</td><td>1. Weight is less due to absence of the tube.</td></tr>
<tr><td>2. Fuel consumption is more as its un-sprung weight is more.</td><td>2. Fuel consumption is less as its un-sprung weight is less.</td></tr>
<tr><td>3. In tubed tyre tube is made of rubber and other components which are bad</td><td>3. The life of tyre is more due to better cooling.</td></tr>
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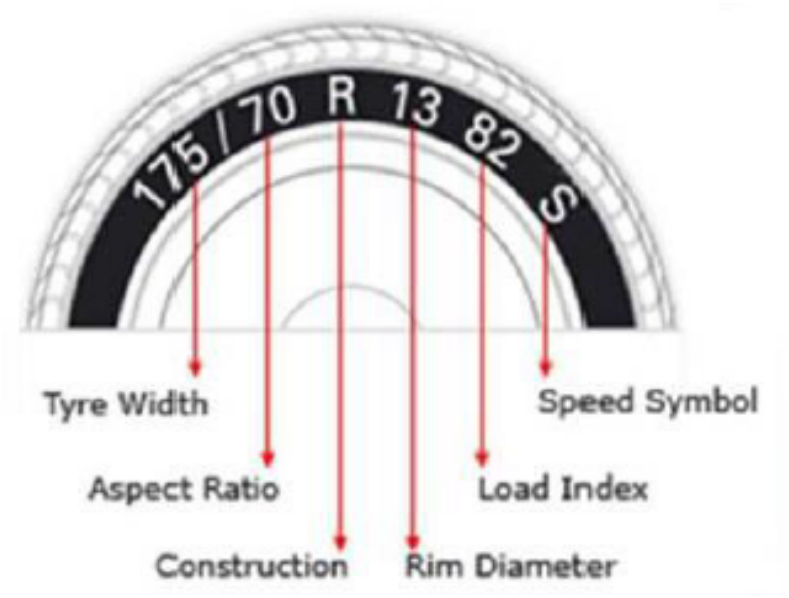
		conductors of heat. The heat dissipation does not take place due to which life of tyre is less.	
		4. Steering and road holding is fair.	4. Steering and road holding is good.
		5. Air retaining liner is not provided on tyre.	5. Air retaining liner is provided
		6. Low air sealing quality.	6. Better air sealing quality.
		7. In case of puncture, both tyre and tube need to be removed.	7. Tyre needs not to be removed. Plug is inserted in case of puncture.
		8 Suitable for spoked wheel rims.	8. Suitable for alloy cast rims
	d)	**What are advantages of radial ply tyre over cross ply tyre**	**04**
		Advantages radial ply tyre over cross ply tyre 1. Stiffness of tyre is less than cross ply tyre so it gives ultimate comfort at high speed. 2. Tyre has firm grip with road. 3. More braking grip. 4. Radial ply tyre has more tread life.	
	e)	**What do you mean by specification of a tyre ?Explain with suitable example.**	**04**
		The tyre is specified by the following method 1. Width (Measured at the widest point when tyre is inflated to the correct pressure) 2. A code number giving speed rating. I) In case of radial tyres, the speed rating code becomes SR, HR or VR o SR speeds up to 170 km/hr o HR speeds up to 210 km/hr o VR speeds more than 210 km/hr II) For cross-ply tyres, the speed rating are coded as S or H 3. Diameter (same as rim diameter) 4. PR represents the number of piles in the tyre **Tyre Specification** E.g. - 175/70 R 13 82 S Where, 175 = tyre Width in mm 70 = Aspect Ratio of tyre in Percentage R = Radial 13 = Rim Diameter in inches 82 = Load Index S = Speed rating	**02** **02**

			
	f)	What are the effects of under inflation pressure & over inflation pressure in tyres	**04**
		Effects of Under-inflation: 1) Uneven tread wear, more wear at tyre sides. 2) Lack of directional stability. 3) Increased rolling resistance leading to increased fuel consumption. 4) Excessive flexing of sidewall causes build up. 5) Vehicle will roll on curves. **Effects of Over-inflation:** 1) Reduced tread contact area with road surface. 2) Reduced tyre grip. 3) Increased vibration resulting in uncomfortable ride. 4) Increased stresses may causes tread separation and crack in the side wall. 5) The centre of tyre will be worn rapidly.	**02** **02**