



جمهورية العراق  
وزارة التعليم العالي والبحث العلمي  
جامعة الفرات الأوسط التقنية  
الكلية التقنية الهندسية / النجف



قسم هندسة تقنيات السيارات

المرحلة الثالثة

أسئلة الفصل الأول للعام الدراسي

٢٠١٥-٢٠١٦

شعبة ضمان الجودة والإدارة العامة

Subject: Automotive Electronics and Computer Control  
Time: 2 hours

Class: 3<sup>rd</sup> year  
Date: 21 / 2 / 2016

*Notes// 1. Please read the questions carefully, 2. Answer all questions*

**Q1. Which one of these (a, b, c, d) is the correct answer? Please read carefully? (20%)**

- 1. What does a short circuit to ground before the load cause?**  
a) An increase in circuit resistance  
b) Voltage to increase  
c) Current flow to increase  
d) Current flow to decrease
- 2. Which of the following is correct?**  
a) Analog signals are either high-low, on-off, or yes-no.  
b) Digital signals are infinitely variable within a defined range.  
c) All of the above.  
d) None of the above.
- 3. In an electrical circuit, a diode functions as a:**  
a) Timing device      b) Switch      c) Resistor      d) Energy storage device.
- 4. Which sensor has a switch that controls the electric fuel pump?**  
a) VAF      b) Hot wire MAF      c) Hot filter MAF      d) MAP
- 5. Which sensor does the TP sensor backup if the PCM determines that a failure has occurred?**  
a) Oxygen sensor      b) MAF sensor      c) MAP sensor      d) Either b or c
- 6. The sensor that must be warmed and functioning before the engine management computer will go to closed loop is the :**  
a) O<sub>2</sub>S      b) ECT sensor      c) MAP sensor      d) BARO sensor
- 7. Two technicians are diagnosing poor fuel economy. Technician A says that this means that the oxygen sensor is supplying improper information to the PCM. Technician B says that this indicates that air filter is blocked. Which technician is correct?**  
a) A only.      b) B only.      c) Both A and B.      d) Neither A nor B.
- 8. Logic gates are being discussed. Technician A says NOT gate operation is similar to that of two switches in series to a load. Technician B says an AND gate simply reverses binary (1) to (0) and vice versa. Who is correct?**  
a) A only.      b) B only.      c) Both A and B.      d) Neither A nor B.
- 9. Two technicians are diagnosing hesitation when accelerating. Technician A says that this means that the knock sensor is supplying improper information to the PCM. Technician B says that this indicates that vacuum hoses for leak. Which technician is correct?**  
a) A only.      b) B only.      c) Both A and B.      d) Neither A nor B.
- 10. All of the sensors can be used to measure movement or position, EXCEPT:**  
a) TP      b) KS      c) VSS      d) CMP



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**Q2.** (20%)

**A\\** Explain in detail the location and function of the following terms: **(answer only five)**

IAT,, MAF,, CMP ,, EGR ,, KS,, CKP

**B\\** What type of voltage signal is produced by TPS and what would you expect to change as the engine goes from idle to W.O.T.?

\*\*\*\*\*

**Q3. Answer only two branches:** (20%)

**A\\** Explain in detail the testing procedure of an engine coolant temperature sensor.

**B\\** Explain the need for a EVAP vapor pressure sensor and how does this compare to a MAP sensor?

**C\\** Describe the basics of NOT, AND, and OR logic gate operation.

\*\*\*\*\*

**Q4. Answer only four branches:** (20%)

1. Explain the need for a turbcharging pressure sensor and how does this compare to a MAP sensor?
2. Define RAM, ROM, PROM.
3. Explain the differences between active and passive sensors
4. Describe the open and closed loop operation of oxygen sensor in electronic fuel injection.
5. Draw a block diagram of basic classification of input sensors feed signals to ECU.
6. Sketch the throttle valve position (TP) sensor electrical circuit.

\*\*\*\*\*

**Q5.** (20%)

**A\\** Specify the problem which due to the following faults: **(answer only five)**

A faulty ECT sensor,, shorted injector,, defective TPS,,

A faulty MAP sensor,, defective oxygen sensor,, A faulty CMP sensor

**B\\** Describe the types of the engine speed sensor. How can you test engine speed sensor?

Lec. Salah M.S.

\*\*\*\*\* WITH BEST WISHES \*\*\*\*\*

Head of Dept.

فلسه السيارات  
3/6

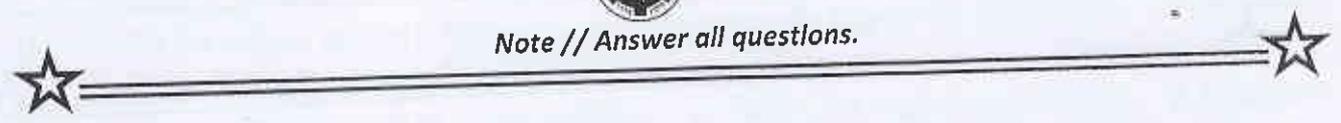
Technical Collage -- Najaf  
Automotive Eng. Department  
First Semester Examination

Subject: measurement and control  
Class: 3<sup>rd</sup> Year

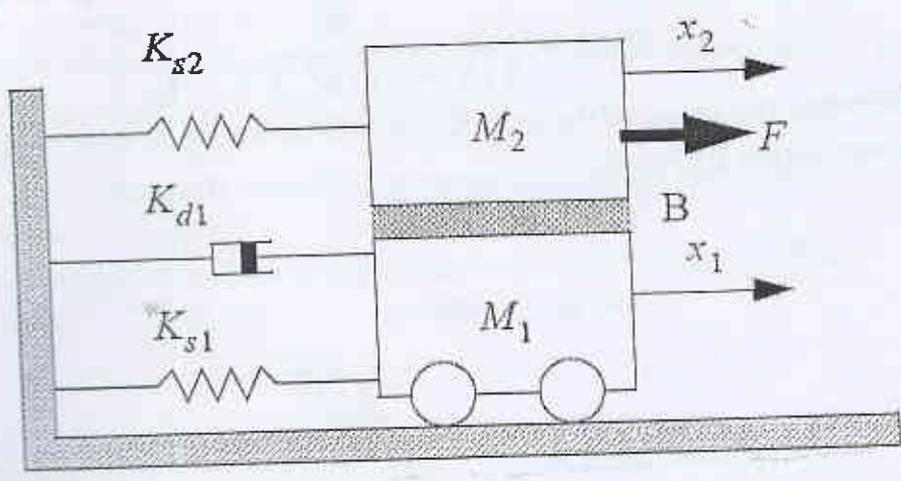
Time: 2 Hour  
Date: / / 2016



Note // Answer all questions.



Q.1) Write the differential equations and its Laplace transform for the system below.



(25 MARKS)

Q.2) Calculate the steady state error for a unity-feedback system with:

$$G(s) = \frac{K(1 + S)}{(S + 3)(S + 5)}, \quad H(s) = 1$$

(25 MARKS)

Q.3) Measurements the output variable of a servomechanism show the system response to be  $C(t) = 1 + 0.2 e^{-60t} - 1.2 e^{-10t}$ , when subjected to unity step input. Check the damping system situation (over damping, critical damping, or under damping).

(25 MARKS)

Technical Collage – Najaf  
Automotive Eng. Department  
First Semester Examination

Subject: measurement and control  
Class: 3<sup>rd</sup> Year



Time: 2 Hour  
Date: / / 2016

Note // Answer all questions.

Q.4) The open loop transfer function of a unity feedback system given by:

$$G(s) = \frac{K}{S(S+3)(S^2+S+1)}$$

Determine the value of the gain K that will cause the system oscillated, also find the oscillation frequency.

(25 MARKS)

*Mohammed N. N.*  
Jan. 24, 2016

Examiner  
Mohammed N. Altemimi



Department Header  
Dr. Haider Hassan

{ Good Luck }



## امتحان الفصل الاول للعام الدراسي 2015 - 2016

Q1. Choose the correct answer which achieve the sentence for **five** of the following : (20 marks)

1. Auto CAD program one of the programs that help .....  
a. Stresses Analysis b. data analysis c. design and engineering drawing d. simulation
2. CAD refers to .....  
a. computer added design b. computer animation design c. car added design  
d. computer automotive design
3. Limit command use to .....  
a. draw circle b. set up drawing borders c. set up drawing color d. draw line .
4. Printing any drawing object by command .....  
a. print b. plot c. print or plot d. writ .
5. To draw rectangle in Auto CAD program at command line by write  
a. recta b. rect c. re d. rec .
6. To change the drawing background go to ..... in command toolbar  
a. format b. file c. view d. tools

Q2. List in the coordinates entry methods in Auto CAD program with explain. (20 marks)

Q3. What is the objects that appear in Auto CAD screen if you write the following steps that written in (macro method), give sketh with dimentions for each one of the following. (choose four only)

(20 marks)

1. L ; 100,100 ; @100,0 ; @0,100 ; @-100,0 ; c ;
2. rec ; f ; 5 ; 0,0 ; 100,100 ;
3. pol ; 8 ; 150,150 ; c ; 100 ;
4. el ; 0,0 ; @100,0 ; 50 ;
5. el ; c ; 50,50 ; @50,0 ; 50 ;

Q4. How can you done the folloing jops in Auto CAD program (writ in by macro method):-

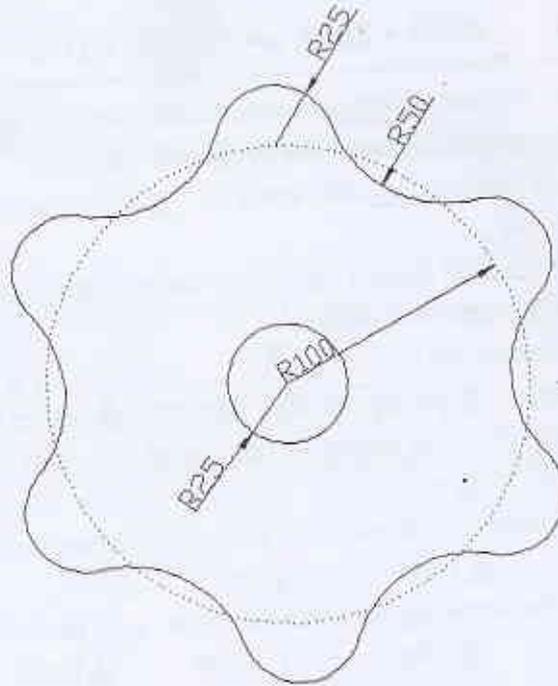
(20 marks)

1. Draw a polygon with 8 sides (the side length is 10mm)
2. Moving the polygon in section (1) for a distance 20 mm to right side.
3. Draw a circle with 25 mm in radius by entering diameter.
4. Draw a squar with side length of (100 mm)



Q5. Write the basic steps to draw the following drawing :-

(20 marks)



GOOD LUCK

*Handwritten signature*

م.م. بلاسم عبد الأمير القرشي  
مدرس المادة

*Handwritten signature*

رئيس القسم  
د. حيدر حسن العبدلي



Note/ (1) Answer FOUR equations only (2) All questions have equal Marks

Q1/A solid steel shaft, (15 mm) diameter and (2.4m) length. Its subjected to torque (T) acting at the ending. The shear modulus of elasticity ( $G=180 \text{ N/mm}^2$ ).

A) If the torque have magnitude  $T=5373 \text{ N.m}$ , what is the maximum shear stress and twist angle in the bar?

B) If the allowable shear stress and twist angle is  $5206 \text{ N.m}$  and  $1.33^\circ$  respectively, what is the maximum permissible torque?

Q2/ A hydraulic press exerts a total load of 50 KN. This load is carried by two steel and copper rods. If the rods have equal cross section area, and the extension in rods is 1.52mm. find:

A) The diameters of rods.

B) The stresses at each rod. Suppose  $E_s=210 \text{ Gpa}$ ,  $E_c=105 \text{ Gpa}$ , rod length=3m

Q3/ A plate 1.77m long and 68mm thick is welded to another plate at right angles to each other by 16.6mm fillet weld. Find the maximum torque that the welded joint can sustain if the permissible shear stress intensity in the welded material is not to exceed  $85 \text{ N/mm}^2$ .

Q4/A hot rolled steel shaft is subjected to torsional load that varies from 300N.m clockwise to (100N.m) anticlockwise and an applied reverse bending moment varies from 400N.m to 200 N.m. The cross section is uniform and no keyway present. Determine the required shaft diameter by taking F.S. is 1.5. For the material take  $\sigma_u=560 \text{ N/mm}^2$ ,  $\sigma_y=420 \text{ N/mm}^2$  and  $\sigma_e=0.5 \sigma_u$

Q5/ Answer the following equations:

A) list the theories of failure under static loads.

B) Explain in details the types of welding joints

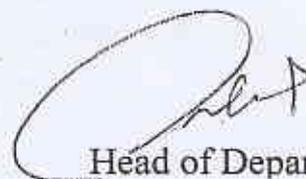
C) Explain the properties that must be met in shaft material.

D) Explain briefly the cases of shaft subjected to bending moment only

E) Show that Goodman Method is depend on ultimate stresses.



  
Lecturer

  
Head of Department

قسم الهندسة  
3/1

**First semester Examination for the academic year 2015-2016**

**Notes: 1- Answer four questions only. 2- All questions have the same mark.**

Q1/ Choose the right answer from the following:

i- Study state heat flow means,

- a) Negligible of heat flow.
- b) Heat flow independent of time.
- c) Uniform rate in temperature rise of a body.
- d) No difference of temperature between the bodies.

ii- Consider a medium in which the heat conduction equation is given in its simplest form as

$$\frac{1}{r} \frac{\partial}{\partial r} \left( kr \frac{\partial T}{\partial r} \right) + \frac{\partial}{\partial z} \left( k \frac{\partial T}{\partial z} \right) + \dot{q} = 0$$

- (a) Is heat transfer steady or transient?
- (b) Is heat transfer one-, two-, or three-dimensional?
- (c) Is there heat generation in the medium?
- (d) Is the thermal conductivity of the medium constant or variable?

iii- Dirichlet condition, a type of boundary conditions, corresponds to a situation for which the surface is maintained;

- a) At constant temperature
- b) At constant heat flux
- c) With no heat flow (insulated)
- d) None of the above

iv- Which of the following expresses thermal diffusivity of a substance in terms of thermal conductivity (k), density ( $\rho$ ) and specific heat (C),

- a) ( $\rho^2 k C$ )      b) ( $1/\rho k C$ )      c) ( $k/\rho C$ )      d) ( $k/\rho C^2$ )

v- Two walls of same thickness and cross section area have thermal conductivities in the ratio 1:4. If same temperature difference is maintained across the wall faces, the ratio of heat flow  $q_1/q_2$  will be;

- a) 0.5      b) 4      c) 0.25      d) 0.4

vi- Consider a layer of insulation which might be installed around a circular pipe. The thermal conductivity of the insulation is (k) and the assembly exposed to an environment with  $T_\infty$ . The critical thickness of insulation can be obtained as ( $r_{cr} = k/h$ ). The heat transfer will be increased by adding more insulation when;

- a)  $r_{cr} > r_o$       b)  $r_{cr} = r_o$       c)  $r_{cr} < r_o$       d)  $r_{cr} = 0$

vii- The medium in which the conduction occurs is isotropic, means that;

- a) The medium is solid and exposed to convection.

- b) The thermal conductivity of the medium is a function of the temperature.
- c) The value of the thermal conductivity is independent of the coordinate direction.
- d) The value of the thermal conductivity is dependent of the coordinate direction.

viii- on heat transfer, fins are used to

- a) Increase temperature gradient so as to improve heat transfer.
- b) Increase the Biot number to improve heat transfer.
- ~~c) Increase surface area to improve heat transfer.~~
- d) Decrease the temperature drop of the flow.

ix- The temperature of a solid surface changes from  $27\text{ }^{\circ}\text{C}$  to  $627\text{ }^{\circ}\text{C}$ . The emissive power changes would then increases by the ratio:

- a) 6:1
- b) 9:1
- c) 27:1
- d) 81:1

x- A thermally transparent surface of transmissivity 0.15, receives 2000 kJ/min of radiation and reflect back 800 kJ/min out of it. The emissivity of the surface is then;

- a) 0.15
- b) 0.54
- c) 0.45
- d) 0.4

Q2/ A one-dimensional plane wall of thickness  $2L = 100\text{ mm}$  experiences uniform thermal energy generation of  $q' = 1000\text{ W/m}^3$  and is convectively cooled at  $x = \pm 50\text{ mm}$  by an ambient fluid characterized by  $T_{\infty} = 20\text{ }^{\circ}\text{C}$ . If the steady-state temperature distribution within the wall is  $T(x) = a(L^2 - x^2) + b$ ; where  $a = 10\text{ }^{\circ}\text{C/m}^2$  and  $b = 30\text{ }^{\circ}\text{C}$ , what is the thermal conductivity of the wall? What is the value of the convection heat transfer coefficient,  $h$ ?

Q3/ A very long copper fin ( $k = 372\text{ W/m}\cdot^{\circ}\text{C}$ ) 2 mm in diameter has a base temperature of  $200\text{ }^{\circ}\text{C}$ . The fin is exposed to an environment with heat transfer coefficient and temperature of  $10\text{ W/m}^2\cdot^{\circ}\text{C}$  and  $20\text{ }^{\circ}\text{C}$ , respectively. Calculate;

- 1- The amount of heat lost from the fin.
- 2- If the very long fin is replaced by five end insulated fins with the same diameter, material and operating conditions, what will be the length of each fin?

Q4/ A 10-m-long thick-walled concrete duct ( $k = 0.75\text{ W/m}\cdot^{\circ}\text{C}$ ) of square cross-section, as shown in Fig. 1. The outer dimensions of the duct are  $20\text{ cm} \times 20\text{ cm}$ , and the thickness of the duct wall is 2 cm. If the inner and outer surfaces of the duct

are at  $100^{\circ}\text{C}$  and  $15^{\circ}\text{C}$ , respectively, determine the rate of heat transfer through the walls of the duct.

Q5/ Steady two-dimensional heat transfer in a long solid bar whose cross section is given in the Fig. 2. The measured temperatures at selected points of the outer surfaces areas shown. The thermal conductivity of the body is  $k = 20\text{W/m} \cdot ^{\circ}\text{C}$ , and there is no heat generation. Using the finite difference method with a mesh size of  $\Delta x = \Delta y = 1.0\text{ cm}$ , determine the temperatures at the indicated points in the medium.

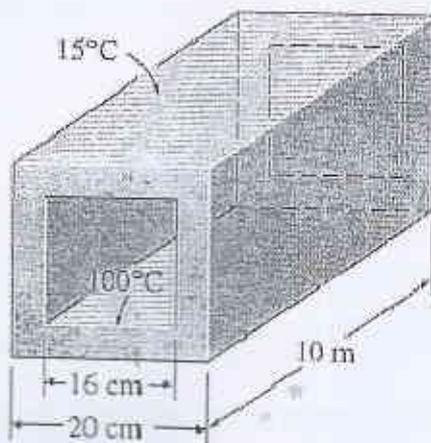


Fig. 1

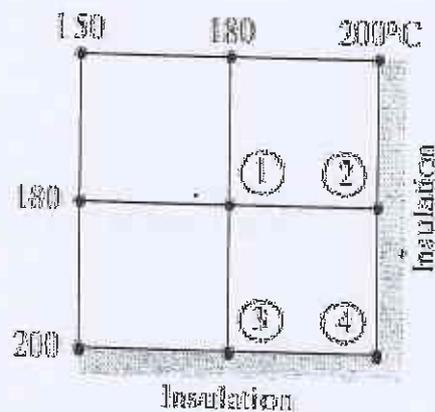
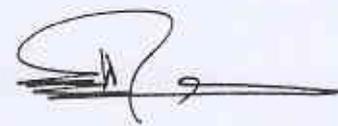


Fig. 2



  
Head of Dep.



Examiner

Dr. Hassan Ali Hamed

Good Luck

<p>المرحلة: الثالثة المادة: الكهليات الزمن: ساعتان الممكن: د. وسام احمد عبد الواحد</p>		<p>وزارة التعليم العالي و البحث العلمي جامعة أسيوط - الأوساط الكهنية الكلية التقنية النوع قسم هندسة تقنية السيارات</p>
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Attempt all questions.

All questions have equal marks

Q1: Find the Laplace transform of the following functions:

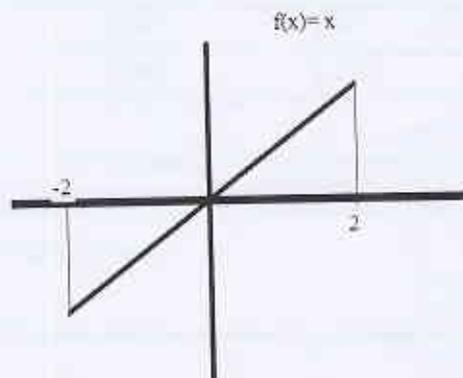
- 1 -  $\sin \pi t$
- 2 -  $\sin 2t \cos 2t$
- 3 -  $e^t \cosh 3t$

Q2: Solve one of the following differential equations by Laplace transform:

$$\ddot{y} + y = 3\cos 2t \quad y(0) = 0. \quad \dot{y}(0) = 0$$

$$\ddot{y} + y = t \quad y(0) = 0. \quad \dot{y}(0) = 0$$

Q3: Find the Fourier transform of the following wave:



Q4: For a vibrating string following the partial differential equation:

$$\frac{\partial^2 u}{\partial x^2} = c^2 \frac{\partial^2 u}{\partial t^2}, \text{ the string starting to vibrate due to initial displacement of}$$

$$F(x) = x, \quad 0 < x < L/3, \text{ and } F(x) = 0, \quad L/3 < x < L.$$

GOOD LUCK

القسم : هندسة تقنية السيارات  
المرحلة : الثالثة  
المادة : نظرية مكانين  
وقت الامتحان : ساعتان  
التاريخ : 2016/ 2/ 28



وزارة التعليم العالي والبحث العلمي  
هيئة التعليم التقني  
جامعة الفرات الاوسط التقنية  
الكلية التقنية الهندسية - النجف

امتحان الفصل الاول للعام ٢٠١٥ - ٢٠١٦

**Note : Answer all the questions**

Q1) In a toggle mechanism shown in fig.(1) the crank OA rotates at 210 rpm CCW increasing at the rate of  $60 \text{ rad/s}^2$ .

Determined :

A) Velocity of slider D and angular velocity of link BD.

B) Acceleration of slider D and angular acceleration of link BD.

(30 MARK)

\*\*\*\*\*

Q2) Four masses A, B, C and D as shown in fig. (2) and table below are to be completely balanced.

	A	B	C	D
MASS (Kg)	-	30	50	40
Radius (mm)	180	240	120	150

The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is  $90^\circ$ . B and C make angles of  $210^\circ$  and  $120^\circ$  respectively with D in the same sense. Find

1-The magnitude and the angular position of mass A

2-The position of planes A and D.

(25 MARK)

\*\*\*\*\*

Q3) A pinion of 20 involute teeth and 125 mm pitch circle diameter drives a rack. The addendum of both pinion and rack is 6.25 mm. What is the least pressure angle which can be used to avoid interference ? With this pressure angle, find the length of the arc of contact and the minimum number of teeth in contact at a time. (20 MARK)

\*\*\*\*\*

Q4) An epicyclic gear consists of A, P and S as shown in Fig(3). The gear A has 72 internal teeth and gear P has 32 external teeth. The gears P meshes with both A and S and is carried on an arm L which rotates about the centre of A at 18 r.p.m.. If the gear A is fixed, determine the speed of gears P and S. (25 MARK)

Fig (1)

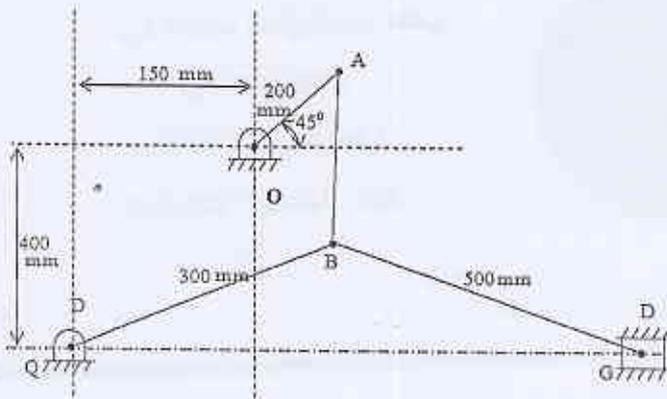


Fig (2)

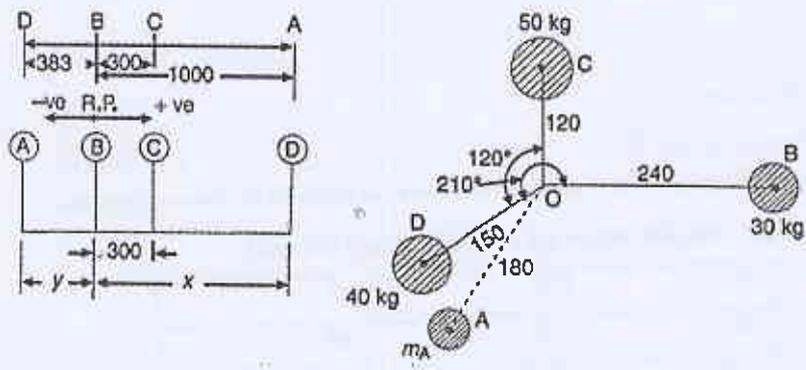
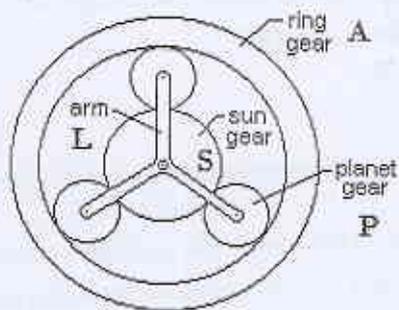


Fig (3)



رئيس القسم

Good luck

مدرس المادة

قسم السيارات  
3/1

Subject: Automotive Technology Ministry of Higher Education and Scientific Research  
Al-Furat Al-Awsat Technical University  
Engineering Technical College / Najaf

Date: 12/2016

Time: 2 hours  
Class: 3<sup>rd</sup>

Note : Answer all questions

Q1. Define five only:

- 1- transaxle 2- torque converter 3- counter shaft 4- rest position of clutch 5- marcel
- 6- overlubricating

Q2. Choose the most correct answer.

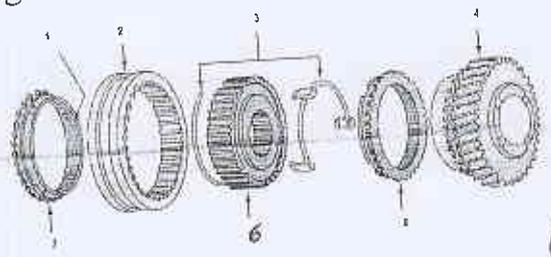
- 1- The sleeve, or quill shaft, often needs ..... during clutch service.  
a) drying      b) lubrication      c) cooling      d) heating
- 2- When the impeller is at maximum speed without rotation of the turbine the .....  
a) engine rotate faster than the vehicle      b) vehicle doesn't move      c) multi disc clutch will slippage      d) greatest torque multiplication occurs
- 3- The flywheel absorbs some of the ..... created by clutch operation  
a) heat      b) vibration      c) noise      d) friction force
- 4- The input gear of counter shaft is engaged with .....  
a) output shaft gear      b) idler gear      c) counter shaft gear      d) input shaft gear
- 5- When the engine running and the vehicle stalled at neutral, ..... shafts are rotates in five speed manual transmission.  
a) input and output      b) no      c) input and counter      d) all

Q3.A/ Explain in detail the shifting procedure from 3<sup>rd</sup> speed to 4<sup>th</sup> speed. (10 marks)

Q3.B/ Explain the operation and the main parts of the torque converter. (10 marks)

Q.4 / What are the benefits of:  
1- multi disc clutch      2- shift fork shaft      3- pilot bearing      4- One-Way Clutch (10 marks)

Q5.A/ What are the main methods used to release the clutch? (10 marks)  
Q5.B/ Name the parts in the figure below.



*Ahmed D. Rabee*  
Teacher  
Ahmed D. Rabee

*[Signature]*  
Head of Department