



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



قسم هندسة تقنيات السيارات

المرحلة الثالثة

أسئلة الفصل الأول للعام الدراسي

٢٠١٧-٢٠١٦

شعبة ضمان الجودة والإدارة العامة
جامعة الفرات الأوسط التقنية

Ministry of Higher Education & Scientific Research
Al-Furat Al-Awsat Technical University
Najaf Technical Engineering College
Auto. & Aero. Departments

Subject: Heat Transfer
Class: 3rd Stage
Exam. Time: 2 H
Examiner: H. GH. Hameed

First semester Examination for the academic year 2016-2017

Notes: 1- Answer four questions only. 2- All questions have the same mark. 3- Answer

Q 1 on the examination paper.

Q1/ Choose the right answer from the following:

i- Steady 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 (ρ) 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_∞ . 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°C to 627°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/ prove that the critical radius of insulation for a spherical shell is:

$$r_{cr} = 2k/h$$

B/ Air at 20°C blows over a carbon steel (1%) 2cm thick hot plate ($k = 43\text{W/m}\cdot^{\circ}\text{C}$) 50 by 75cm maintained at 250°C . The convection heat transfer coefficient is $25\text{W/m}^2\cdot^{\circ}\text{C}$ and that 300W is lost from the plate surface by radiation, calculate the inside plate temperature.

Q3/ A hollow tube composed of two layers. The inner tube is with inner diameter of 0.2m and 0.05m thick and $70\text{W/m}\cdot^{\circ}\text{C}$ thermal conductivity. The outer tube is with 0.01m thick and $1\text{W/m}\cdot^{\circ}\text{C}$ thermal conductivity. A hot fluid with 80°C flows inside the composed tube with $100\text{W/m}^2\cdot^{\circ}\text{C}$ heat transfer coefficient. The composed tube exposed to the ambient at 20°C and $10\text{W/m}^2\cdot^{\circ}\text{C}$ heat transfer coefficient. Calculate:

- a) The overall heat transfer coefficient based on outer area.
- b) The amount of heat transfer per unit length.
- c) The temperature between the two tube layers.

Q4/ A set of radial aluminum fins ($k= 180\text{W/m.K}$) as shown in Fig. (1) that are to be fitted to a smaller air compressor. The device dissipates 1KW by connecting to the surrounding air which is at 20°C . Each fin is 100mm long, 30mm height and 5mm thick. The tip of each fin may be assumed to be adiabatic and a heat transfer coefficient $h= 15\text{W/m}^2.\text{K}$ acting over the remaining surfaces. Estimate the number of fins required to ensure the base temperature (120°C) does not exceed.

Q5/ Hot water at 85°C flows through a thin-walled copper tube of 30mm diameter. The tube is enclosed by an eccentric cylindrical shell that is maintained at 35°C and has a diameter of 120mm . The eccentricity, defined as the separation between the centers of the tube and shell, is 20mm . The space between the tube and shell is filled with an insulating material having a thermal conductivity of 0.05 W/m. K . Calculate the heat loss per unit length of the tube, and compare the result with the heat loss for a concentric arrangement.

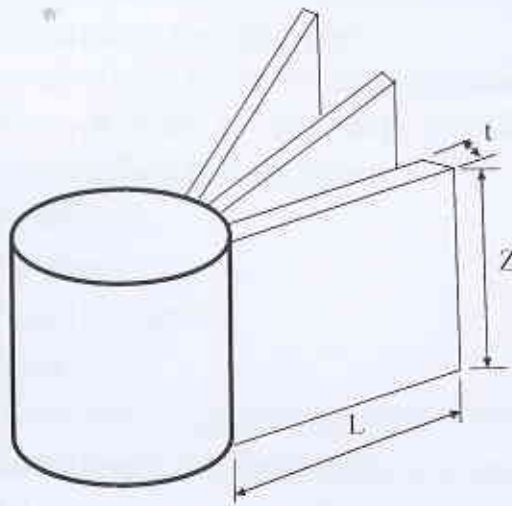


Fig. 1

Head of Dep.

Examiner

Good Luck

Subject: Advanced Automotive
Technology

Ministry of Higher Education
and Scientific Research

Date: / /2017

Time: 2 hours

Al-Furat Al-Awsat Technical University

Class: 4th

Engineering Technical College / Najaf

Note : Answer all questions

Q1. Define **five** only:

(20 marks)

- 1- Pressure Ratio 2- Direct Injection 3- Twincharging
4- Tubular Space Frame 5- Integrated motor assist 6- Cam Shifting

Q2. Select the most correct answer:

(20 marks)

1- The objective of a turbocharger is to improve an engine's volumetric efficiency by increasing of the intake gas (usually air).

- a) density b) speed c) temperature d) volume

2- The used to changes the oscillation position of the oscillating cam and therefore modifies the lift and events in a continuously variable way.

- a) main cam b) cam shaft c) control arm d) push rod

3- The is a metal box that is completely closed with bolts.

- a) high pressure fuel pump b) engine c) transmission d) integrated power unit

4- In the DI gasoline engines, power output improvement can be achieved by up to % over traditional PFI engines.

- a) 10 b) 15 c) 20 d) 25

5- In The Bosch Jetronic fuel injection system went into production.

- a) 1967 b) 1951 c) 1979 d) 1976

Q3/A/ In the stratified operation the A/F ratio is lean and A/F ratio can access until 40/1, while the stoichiometric is 14.7:1. Explain . (10M)

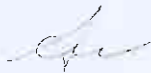
Q3/B/ What are the advantage and disadvantage of unibody structure? (10M)


Q4/A/ Why the GDI engines are very suitable for turbocharger applications? (10M)

Q4/B/ What are the main types of turbocharging system? What are the advantage and disadvantage of each one? (10M)

Q5/A/ Explain the operation of Valve Timing Control (VTC) system. (12M)

Q5/B/ What are the main types of hybrid vehicles? (8M)


Teacher
Ahmed D. Rabee


Head of Department
Dr. Haider Hasan

GOOD LUCK

Technical Collage – Najaf
Automotive Eng. Department
First Semester Examination

Subject: measurement and control
Class: 3rd Year



Time: 2 Hour
Date: /01/ 2017

Q.2\

(35 MARKS)

1) Determine the step response of the following system:

$$TF = \frac{Y(S)}{R(S)} = \frac{3(2+S)}{(S^2+0.8S+0.15)}$$

Due to 2 step input response ($r(t)=2$).

2) Calculate the steady-state error

Q.3\ Check the stability for the system has characteristic equation

$$1 + \frac{K^*}{s^2(s+1)(s+5)} = 0, \text{ using root locus technique.}$$

(35 MARKS)

Mohammed N. N.
Jan. 08. 2017

Examiner
Mohammed N. Altemimi



Dr. Haider Hassan

Department Header
Dr. Haider Hassan

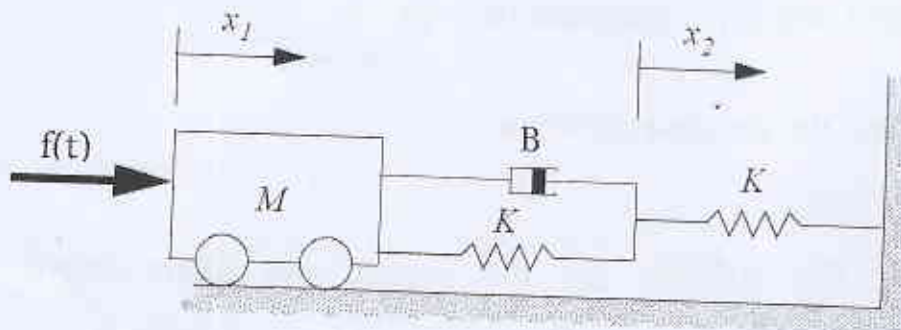
{ Good Luck }



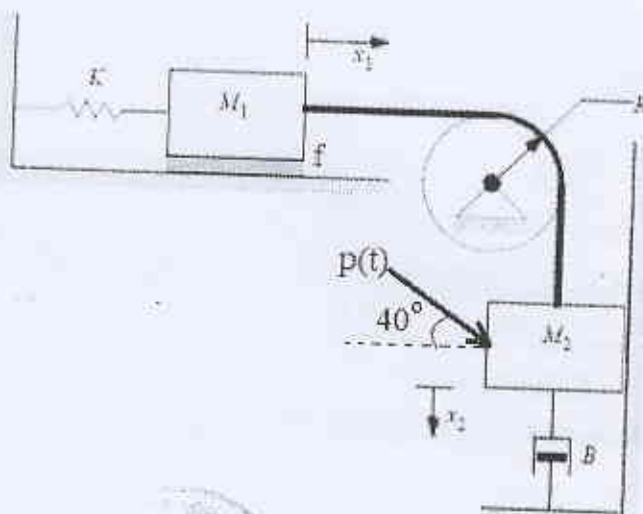
Q.1| Solve For One Branch (A or B)

(30 MARKS)

A) Drive the transfer function for the mechanical system below, for the input system force $f(t)$ and the system output displacement $X_2(t)$.



B) Write the differential equations and its Laplace transform for the system below. In this system the upper mass, M_1 , is between a spring and a cable and there is viscous damping between the mass and the floor. The suspended mass, M_2 , is between the cable and a damper. The cable runs over a massless, frictionless pulley.



(2) All questions have equal Marks

Notes / (1) Answer Four questions only

Q1/ 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 $\sigma_c=0.5 \sigma_u$

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 $E_s=210 \text{ Gpa}$, $E_c=105 \text{ Gpa}$, rods length 3m

Q3/ A hollow cylindrical steel shaft is 1.5m and the ratio of inside to outside diameters is (2/3).

A) What's the corresponding minimum value of the shearing stress in the shaft if the torque and shearing stress are not exceeding 4.05KN.m and 120 Mpa respectively?

B) what angle of twist will create at shearing stress of 70 Mpa on the inner surface of the hollow steel shaft? (Note/ angle of twist must be in degrees).

Q4/ 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 ($G=180 \text{ KN/mm}^2$).

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

B) If the allowable shear stress and twist angle is 5206 N.m and 1.33° respectively. what is the maximum permissible torque?

Q5/ A machine component is subjected to a flexural stress which is fluctuates between (300 MN/m^2) and (-150 MN/m^2). Design the value of minimum ultimate strength according to 1. Gerber relation 2. Goodman relation 3. Soderberg relation. Take yield strength = 0.55 Ultimate strength; Endurance strength = 0.5 Ultimate strength and factor of safety = 2.


Lecturer


Head of Department

المادة: حاسبة (Auto CAD)
القسم و المرحلة: السيارات - الثالثة
الوقت : ساعتان
التاريخ: 2017/ 1 /23

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنية
الكلية التقنية الهندسية / النجف
اللجنة الامتحانية

أسئلة امتحان الفصل الاول للعام الدراسي 2016-2017

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

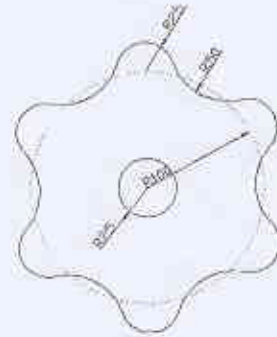
1. Auto CAD program one of the programs that help
a. Stresses Analysis b. data analysis c. design and engineering drawing d. simulation
2. CAD refers to
a. computer added design b. computer animation design c. car added design
d. computer automotive design
3. Limit command use to
a. draw circle b. set 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. How can you done the folloing jops in Auto CAD program (**choose 4 only**) (20 marks)

1. Drwaing 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. Drawing square with side length 20mm.
4. Drawing circle with 50mm in diameter by (3points method).
5. Repetation circle in section (4) in form of matrix (4x4), with offset 30mm.

Q4. Write the basic steps to draw the folloing drawing :-



(20 marks)

Q5. Draw a circle with radius (50 mm) and center point of (100,100) using four methods to drawing circle in command line.

(20 marks)

م.م. بلاسم عبد الأمير الفريشي
مدرس المادة

GOOD LUCK

رئيس القسم
د. حيدر حسن العبدلي

Subject: Automotive Technology

Ministry of Higher Education
and Scientific Research

Date: /1/2017

Time: 2 hours

Al-Furat Al-Awsat Technical University

Class: 3rd

Engineering Technical College / Najaf

Note : Answer **four** questions only

Q1. Define **four** only:

(20 marks)

1- transaxle 2- torque converter 3- counter shaft 4- drive line 5- one-way clutch

Q2. Choose the most correct answer.

(20 marks)

1- The propeller shaft is made as a hollow to reduce the.....

a) velocity b) weight c) noise 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 3rd speed to 4th 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:

(20 marks)

1- Springs of the friction disk 2- shift fork shaft 3- slide joint of the propeller shaft 4- One-Way Clutch

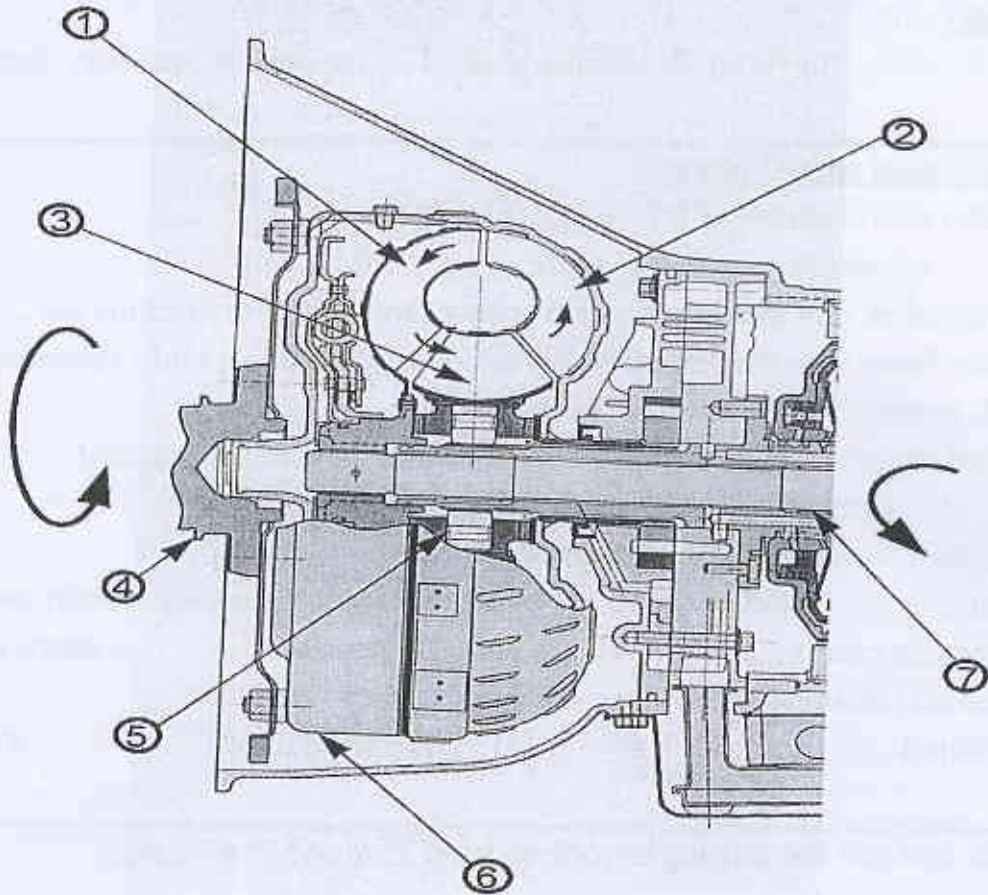
Q5.A/ What are the main methods used to release the clutch?

(10 marks)



Q5.B/ Name the parts in the figure below.

(10 marks)



Teacher
Hyder Ali



Head of Department

GOOD LUCK

2-2



Ministry of Higher Education & Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College- Najaf
Department of Aeronautical Eng. Tech.

Class Level: 3rd year

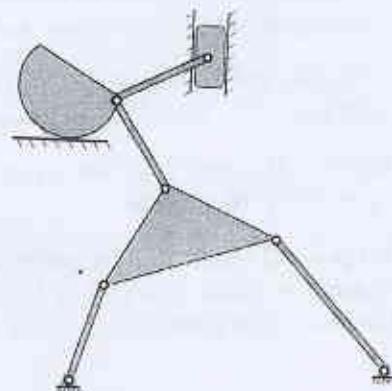
Instructor: Dr. Assaad Al-Sahlani

Mid-term 1 / 2016-2017

Course Title: Theory of Machines
Time: 2 hours

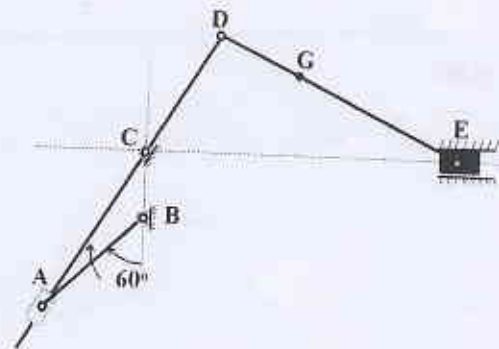
Q1: For the system of links shown, the shaded areas are solid links. The circles represent rotating joints. Be sure to show your work to find:

1. Number of links. (8 points)
2. Number of joints. (8 points) and
3. DOF of the system and clarify the nature of the system (Mechanism, structure or pre-loaded structure) (4 points)



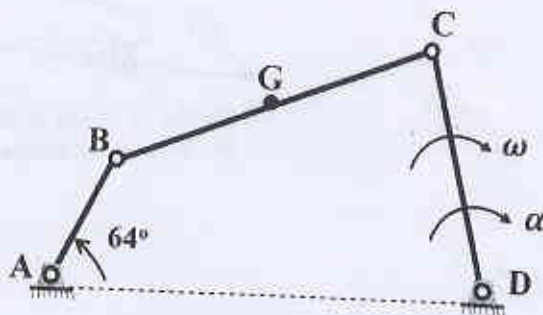
Q2: For the mechanism shown

1. Accurately redraw the mechanism with scale factor of ($S.F_p = 0.02 \text{ cm/mm}$). The distance between the fixed centers is $CB = 100 \text{ mm}$, crank $AB = 200 \text{ mm}$; $CD = 200 \text{ mm}$ and the link $DE = 400 \text{ mm}$ with its center of gravity G , 100 mm from D . (15 points)
2. If crank AB rotates at 4 rad/s clockwise, draw graphically the velocity diagram, and (10 points)
3. Find the magnitude and direction of (a) velocity of point G , and (b) the angular velocity of link DE . (5 points)

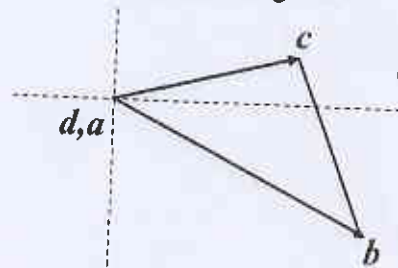


Q3: In the four bar mechanism shown, the velocity diagram is obtained along with the position diagram, the distance between the fixed centers is $AD = 90 \text{ mm}$, crank $AB = 30 \text{ mm}$; $BC = 70 \text{ mm}$ and $CD = 50 \text{ mm}$.

1. If $\omega = 40 \text{ rad/s}$ and $\alpha = 0$, use the velocity diagram (drawn with scale factor of $S.F_v = 1.25$) shown to graphically represent the acceleration diagram of the mechanism. (15 points)
2. Find the magnitude and direction of the acceleration of point G . (8 points)
3. Find the magnitude and direction of angular accelerations of links AB and BC . Which one is deceleration? (7 points)



Position diagram

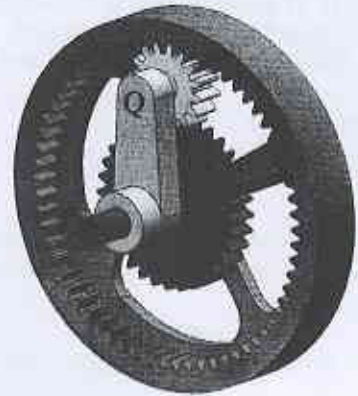


$S.F_v = 1.25 \text{ cm/s}$

Velocity diagram

Next page please.....

Q1: For the planetary gears shown, the number of teeth for the ring gear is twice the number of teeth of sun gear ($N_R = 2N_S$), also the number of teeth for the sun gear is twice the number of teeth for planet gear ($N_S = 2N_P$)



- (A) Establish the table that links the relationships between the angular velocities of gears and arm. (5 points)
- (B) If the sun gear is fixed ($\omega_s = 0$) and the ring gear rotates with ($\omega_r = 100$ r.p.m CW), find ω_{arm} . (5 points)
- (C) Repeat (B) with ($\omega_s = 100$ r.p.m CCW) and ($\omega_r = 100$ r.p.m CW). (5 points)
- (D) Let point Q represents the center of the planet gear (end of arm), in which case (B) or (C), the linear velocity of the point Q is greater? Why? (5 points)

Good Luck!

Cordially !

Instructor & Head of Dept.
Dr. Assaad Al Sahlani

Subject: Automotive Electronics
and Computer Control

Ministry of Higher Education
and Scientific Research

Date: / /2017

Time: 2 hours

Al-Furat Al-Awsat Technical University

Class: 3rd

Engineering Technical College / Najaf

Note : Answer all questions

Q1. Define **five** only:

- 1- variable resistance
 - 2- Vane air flow sensor
 - 3- One-Wire Circuit
 - 4- idle contact switch
 - 5- negative temperature coefficient
 - 6- load
- (20 marks)

Q2/ Select the **most correct** answer:

- 1- Computer signals can be (20 marks)
 - a) volt or current
 - b) digital or analog
 - c) high or low
 - d) zero or one
- 2- absorbs alternator or ignition system "noise" that may be heard in the speakers.
 - a) capacitors
 - b) resistance
 - c) diodes
 - d) Integrated Circuit (IC)
- 3-....., change a physical condition into an electrical signal
 - a) magnetic
 - b) computer
 - c) transistors
 - d) transducers
- 4- A single zero or a one is called a
 - a) byte
 - b) word
 - c) bit
 - d) nibble
- 5- PCM calculates engine oil life based on.....
 - a) oil temperature
 - b) engine RPM
 - c) run time
 - d) all of them

Q3/A/ Compare between Hot wire sensor and Hot film sensor.

(10M)

Q3/B/ Compare between THW and THA sensors.

(10M)

Q4/A/ Draw the following gates with test table. 1) NAND 2) NOT

(10M)

Q4/B/ In figure 1 compare between A and B wave form

(10M)

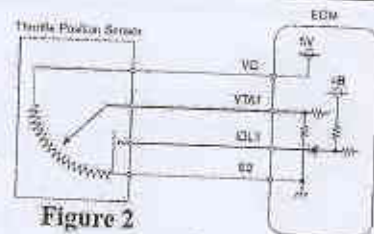
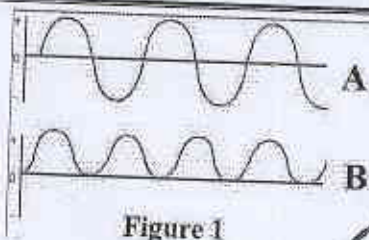
Q5/A/ What happening to VTA1 and IDL1 when the wiper moves up and down in fig.2 (10M)

Q5/B/ Draw a simple circuit with main components

(5M)

Q5/C/ What are the locations of Intake Air Temperature (IAT) sensor?

(5M)



Ahmed D. Rabee
Teacher
Ahmed D. Rabee



Dr. Haider Hasan
Head of Department
Dr. Haider Hasan

Good luck

قسم الرياضيات
٤/١/١٧

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Tech. Eng. College – Najaf/Automobile Tech. Eng. Dept.
1st Course Examination, January-2017



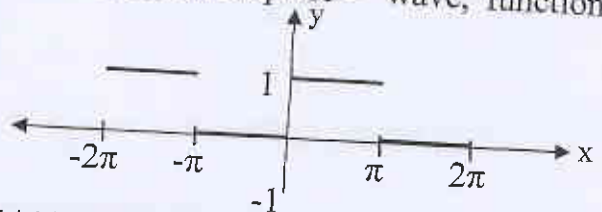
Subject: Engineering and Numerical Analysis
Time: 2 hours

Class: 3rd year.
Date: / /2017.

Note// Answer four questions, each question carries 25 marks

Q1) Finds the Fourier coefficients and Fourier series of the square – wave, function defined by:

$$f(x) = \begin{cases} 0 & \text{if } -\pi \leq x < 0 \\ 1 & \text{if } 0 \leq x \leq \pi \end{cases}$$



Q2) Classification and Solve the differential equations?

1. $(D^3 + 2D^2 + D)y = e^{2x} + \sin(2x)$

(Using Short method)

2. $y'' + y' - 12y = e^{3x}$

(Using Undetermined coefficients)

3. $(D^2 - 4D + 4)y = e^{2x} \sin(3x)$

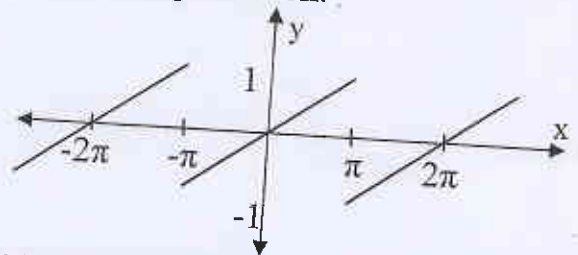
(Using Differential operator (D_0))

Q3) A spring with a mass of $2kg$ has natural length $0.5m$, it's immersed in a fluid with damping force constant $c=40$. A force of $25.6N$ is required to maintain in stretched to a length of $0.7m$ and then released with initial velocity 0 , find the position of the mass at any time t ?



Q4) Finds the Fourier coefficients and Fourier series of the following function:

$f(x) = x$
 $-\pi \leq x < \pi$



Q5) Solve the following differential equation by Laplace transforms at initial conditions $y(0) = 1$ $y'(0) = 1$.

$$\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = e^{2x}$$

Dr. Qahtan A. Abed
Examiner



Dr. Hyder H. Balla
Head of Department