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

قسم هندسة تقنيات السيارات

المرحلة الثانية

أسئلة الامتحان النهائي للعام الدراسي

٢٠١٥-٢٠١٦

الدور الأول

شعبة ضمان الجودة و الأداء الجامعي

قسم السيارات
٢٠١٦/٥/٦

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنية
الكلية التقنية/نجف
الهندسية

القسم : قسم الاتصالات / السيارات
المرحلة :الثانية
المادة: حاسبة
وقت الامتحان :ثلاث ساعات
التأريخ: ٢٠١٦/٥/٦

الامتحان النهائي للعام الدراسي 2015 – 2016

Answer All Questions

Q1:Select the correct choice for the following statements: **(Answer 5 only)** **(20 degree)**

1. **Assume txtName is a textbox control, which of the following is a valid assignment statement?**
   A. txtName = 'Jones'
   B. txtName.Caption = 'Jones'
   C. txtName.Text = "Jones"
   D. txtName.Text = 'Jones'

2. **How do we declare a variable?**
   A. Using Integer command
   B. Using DIM command
   C. Using A and B command in the Public Class
   D. using private sub

3. **Creates a box that can be used to retrieve one piece of information from a user.**
   A. MSGBOX B. INPUTBOX C. Dialog Box D.Label

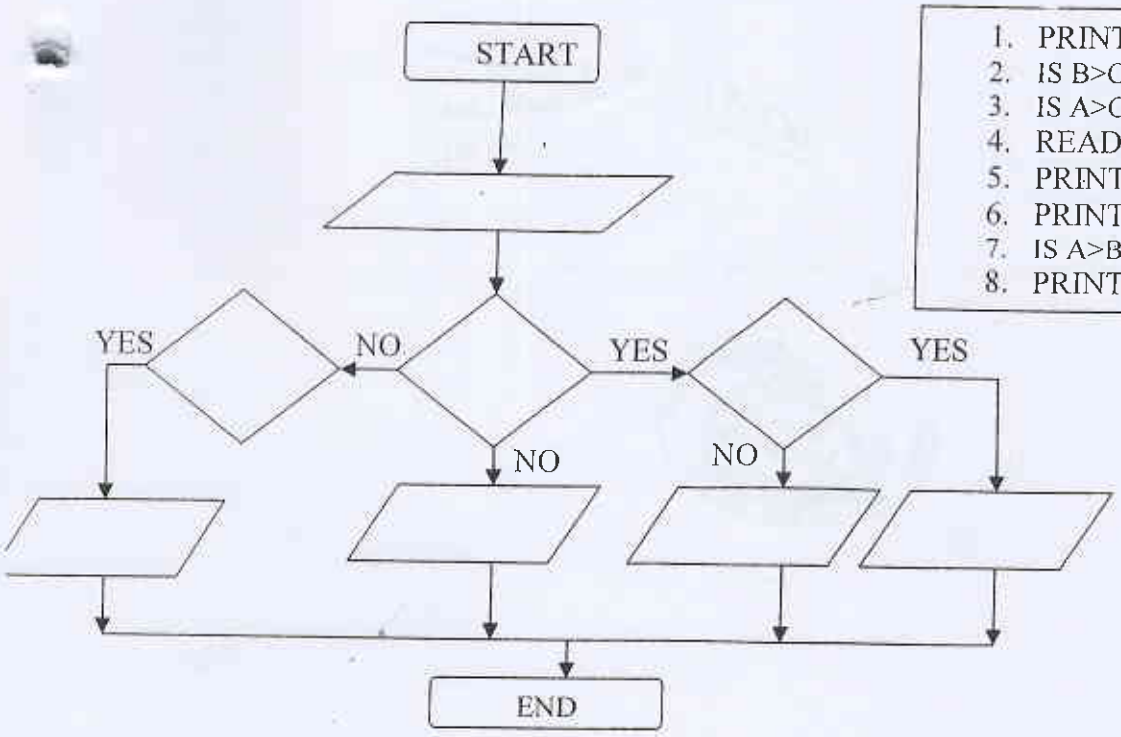
4. **The code statement, 27 < = 15, will have a resulting condition**
   A: no B: true C: false D : none

5. **It can contain 0 to 2 billion Unicode characters.**
   A. Byte B. Char C.Single D. String

6. **When you click the Visible arrow in the Properties window, the following is displayed**
   A: Yes, No B: True, False C: 1,0 D. Enable, Disable

Q2: Complete the flowchart to find the largest of three numbers A,B, and C from the following statement. **(16 degree)**

1. PRINT B
2. IS B>C
3. IS A>C
4. READ A, B, C
5. PRINT C
6. PRINT A
7. IS A>B
8. PRINT C



Q3: Answer by True or False and correct the False statement **(10 degree)**

1. The variable with name (TXTName) is valid
2. MsgBox(Math.Sqrt(64)) will give 8 as result
3. This code is a correct declaration to declare variable (dim x as integer =2)
4. MsgBox(Math.Round(676.378654)) will give 676 as result
5. To set the button color to red we use this code (button1.backcolor = color.red)

Q4: Give the correct representation in visual basic for the following equations: **(15 degree)**

1. $\cos(t^3) - 5$
2. $\tan(t+3)$.
3. $56 - \sin(90)$.
4. $\cos(t) + \sin(t)$.
5. $e^t - 12$.

Q5: **In internet there are many terms used; define the followings:** **(24 degree)**

1. Bandwidth	2. IP	3. ISDL
4. Mbps	5.FTP	6.HTTP

Q6: DO **only one** of the following :

(15 degree)

1. Write complete program to **Insert new column in matrix x(2, 2).**
2. Write complete program to **Print the second and third coulmn of matrix x(3, 3) in listbox1.**

بالتوفيق

مدرس المادة:

26/05/2016

رئيس القسم:

قسم السيارات
٢/٢

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الأوسط التقنية
الكلية التقنية الهندسية النجف
قسم هندسة السيارات

المادة: تكنولوجيا المحركات
المرحلة : الثانية
الزمن: ثلاث ساعات
التأريخ: 2016/6/

الامتحان النهائي الدور الاول للعام الدراسي 2016/2015

Q1\ Choose the correct answer: **(20 Marks)**

1- Typical radiator cap pressure is .....
(A) (110-120 kPa) (C) (83-110 kPa)
(B) (70-83 kPa) (D) Non above

2- An engine's operating temperature is usually between:
(A)82° F and 99° F (C) 125° F and 150° F
(B) 100° F and 120° F (D) 180° F and 210° F

3- Which of the following is not a basic cylinder arrangement?
(A)Slant (B) Inline (C) U-type (D) V-type

4-Which of the following helps prevent crankshaft vibration and damage?
(A)Crank damper (C) Harmonic balancer
(B) Vibration damper (D) All of the above.

5- Antifreeze serves each of these functions except
(A)Lubricate water pump (C) prevent winter freeze up.
(B)prevent rust and corrosion (D) control engine temperature

6- Which of the following is not a radiator cap function?
(A)Absorb heat (C) Pressurize system
(B) Seal radiator (D) Relieve excess pressure

7- the following is not used as a fuel filter.
(A)Pleated paper filter (C) Bowl filter
(B)Sintered iron filter (D) Foam filter

8- This is the most common and modern type of gasoline injection system.
(A)Mechanical fuel injection. (C)Electronic fuel injection
(B) Hydraulic fuel injection (D) Pneumatic fuel injection

9- This type of gasoline injection pulses the injectors open and closed independently of the engine valve action.
(A)Timed injection (C) Continuous injection
(B) Intermitted injection (D) Bank injection

10-Which of the following is not a typical air-fuel ratio for a gasoline engine?
(A)8:1 (B) 16:1 (c) 3:1 (D) 18:1

Q2: Answer all the followings

1- What are the basic components of Lubrication system? Explain them?
2- Explain the operation of Thermostat in cooling system?
3- List and explain the basic parts of a cooling system?
4-Explain the operation of Electronic Fuel Injector?

Q3: Answer *four* of the followings:

1- List the flywheel functions?
2- List the functions of Thermostat?
3- What are the main functions of Lubrication system?
4- Give the purpose of idle air bleed?
5- What are the advantages of Gasoline Injection?

Q4: Answer ***four*** of the followings: **(20 Marks)**

1-What are the differences between closed and open cooling systems?
2-What are the differences between two-stroke cycle and four-stroke cycle engines
3-What are the differences between Air and Liquid cooling systems?
4-What are the differences between spark ignition and compression ignition engines?
5- What are the main differences between mechanical and electric fuel pumps?

Q5: Define ***five*** only of the following

1- Piston
2- DOHC
3- Thermostatic fan clutch
4- Pressure relief valve
5- Fuel hoses
6- Throttle position sensor
7-High-speed jet

Good Luck

Examiner
A.Lec. Hussein Al-Abidi

Head of Department
Dr. Hyder Hassan

قسم السيارات
م/س

ATU University
Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.
Grade Level: 2nd.
Object: Strength of Materials.
Exam Time: 3 hours.

****

Note: Endeavor All Questions

Group (A): Mechanics of Materials Conceptions (40 Marks)

Q1: What is the effect of the following states? (20 Marks)

(1) $\sigma_{Allow} = \sigma_{Fail}$.

(2) Body stressed under proportion limit.

(3) K and n constants in deflected body.

(4) Error in reading of strain gauge.

(5) Lateral to longitudinal strains.

Q2: Prove the following equations: (20 Marks)

(1) $\epsilon_t = \ln\frac{1}{1-r}$ (2) $\epsilon_t = \ln\left(\frac{\sigma_t}{\sigma_e}\right)$

Group (B): Mechanics of Materials Problems (60 Marks)

Q1: The rigid beam shown in figure (1) is fixed to the top of the three posts made of A-36 steel and 2014-T6 aluminum. The posts each have a length of 250 mm when no load is applied to the beam, and the temperature is ($T_1 = 20$ °C). Determine the force supported by each post if the bar is subjected to a uniform distributed load of (150 kN/m) and the temperature is raised to ($T_2 = 80$ °C). (20 Marks)

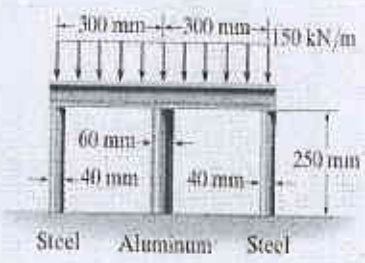


Figure (1) Posts support

Q2: Draw S.F.D and B.M.D that is indicating in figure (2): (20 Marks)

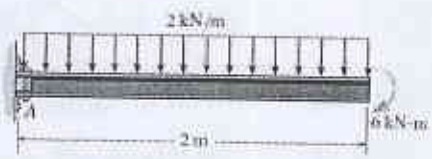


Figure (2) Cantilever beam

****

Q3: Select the one of the following questions: (20 Marks)

(A) The control arm is subjected to the loading shown in figure (3). Determine to the nearest $(3/4)$ inch the required diameter of the steel pin at C if the allowable shear stress for the steel is τ_{allow}= (8) ksi.

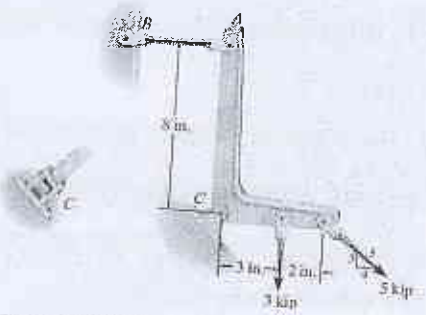


Figure (3) Control arm fixed by two pins

(B) When force P is applied to the rigid lever arm (ABC) in figure (4), the arm rotates counterclockwise about pin A through an angle of (0.05°). Determine the normal strain developed in wire (BD).

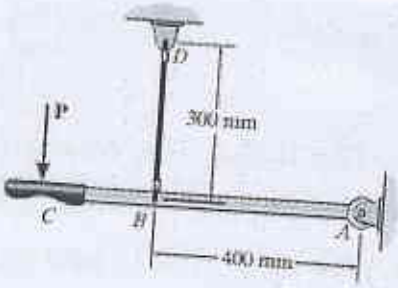


Figure (4) Arm rotates about pin

GOOD LUCK

Examiner
A.Lecturer: Mohammed A. Abass

Head of Aeronautical Dep.
A. Prof. Dr. Ali S. Baqir

Head of Automobile Dep.
Dr. Haider H. Al-Abdili

Average Mechanical Properties of Typical Engineering Materials[a]
(SI Units)

Materials	Density ρ (Mg/m³)	Modulus of Elasticity E (GPa)	Modulus of Rigidity G (GPa)	Yield Strength (MPa) σ_Y Tens.	Comp.[b]	Shear	Ultimate Strength (MPa) σ_u Tens.	Comp.[b]	Shear	% Elongation in 50 mm specimen	Poisson's Ratio ν	Coef. of Therm. Expansion α $(10^{-6})/°C$
Metallic												
Aluminum Wrought Alloys — 2014-T6	2.79	73.1	27	414	414	172	469	469	290	10	0.35	23
Aluminum Wrought Alloys — 6061-T6	2.71	68.9	26	255	255	131	290	290	186	12	0.35	24
Cast Iron Alloys — Gray ASTM 20	7.19	67.0	27	–	–	–	179	669	–	0.6	0.28	12
Cast Iron Alloys — Malleable ASTM A-197	7.28	172	68	–	–	–	276	572	–	5	0.28	12
Copper Alloys — Red Brass C83400	8.74	101	37	70.0	70.0	–	241	241	–	35	0.35	18
Copper Alloys — Bronze C86100	8.83	103	38	345	345	–	655	655	–	20	0.34	17
Magnesium Alloy [Am 1004-T61]	1.83	44.7	18	152	152	–	276	276	152	1	0.30	26
Steel Alloys — Structural A36	7.85	200	75	250	250	–	400	400	–	30	0.32	12
Steel Alloys — Stainless 304	7.86	193	75	207	207	–	517	517	–	40	0.27	17
Steel Alloys — Tool L2	8.16	200	75	703	703	–	800	800	–	22	0.32	12
Titanium Alloy [Ti-6Al-4V]	4.43	120	44	924	924	–	1,000	1,000	–	16	0.36	9.4
Nonmetallic												
Concrete — Low Strength	2.38	22.1	–	–	–	12	–	–	–	–	0.15	11
Concrete — High Strength	2.38	29.0	–	–	–	38	–	–	–	–	0.15	11
Plastic Reinforced — Kevlar 49	1.45	131	–	–	–	–	717	483	20.3	2.8	0.34	–
Plastic Reinforced — 50% Glass	1.45	72.4	–	–	–	–	90	131	–	–	0.34	–
Wood Select Structural Grade — Douglas Fir	0.47	13.1	–	–	–	–	2.1[c]	26[d]	6.2[d]	–	0.29[e]	–
Wood Select Structural Grade — White Spruce	3.60	9.65	–	–	–	–	2.5[c]	36[d]	6.7[d]	–	0.31[c]	–

[a] Specific values may vary for a particular material due to alloy or mineral composition, mechanical working of the specimen, or heat treatment. For a more exact value reference books for the material should be consulted.

[b] The yield and ultimate strengths for ductile materials can be assumed equal for both tension and compression.

[c] Measured perpendicular to the grain.

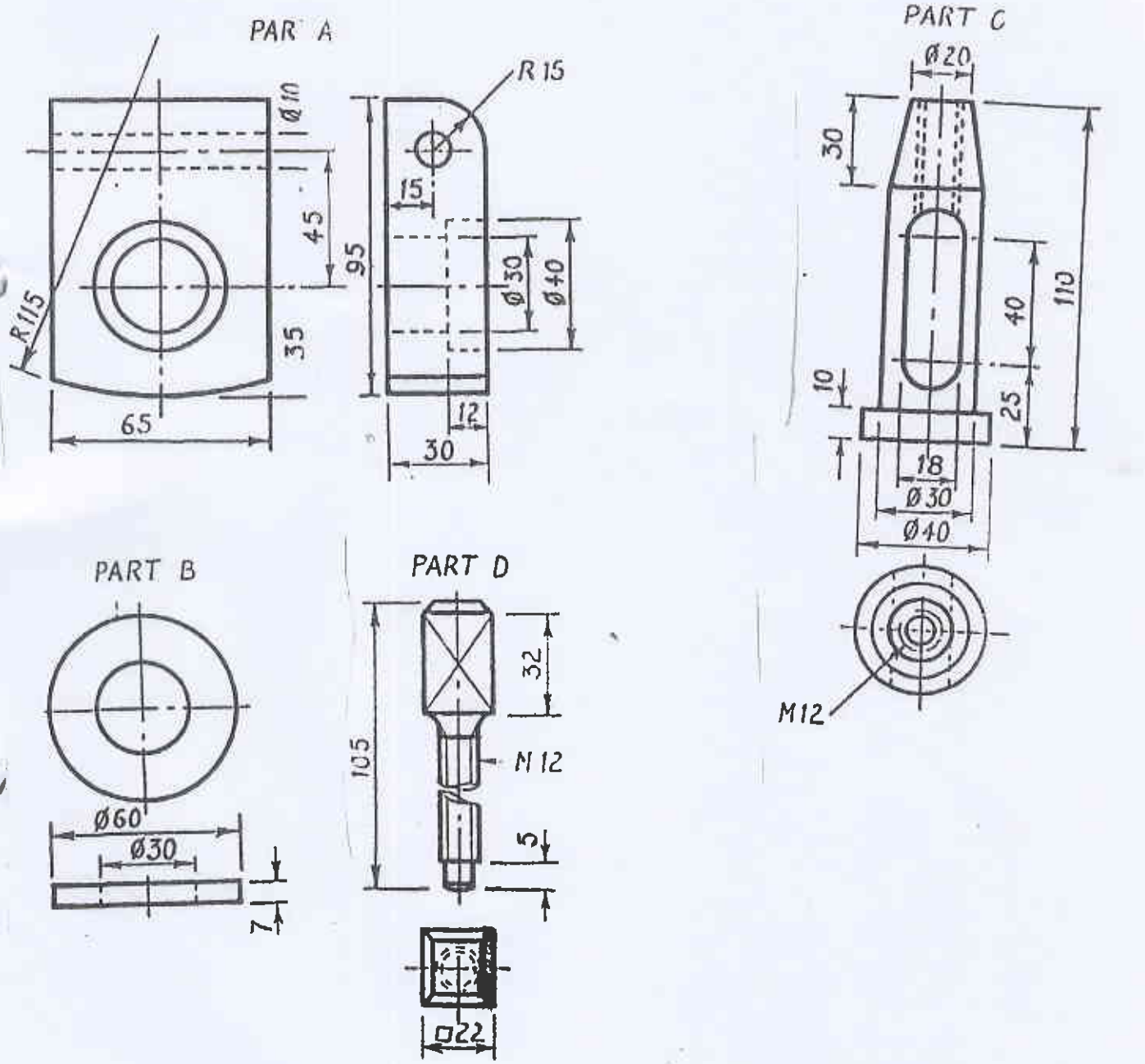
[d] Measured parallel to the grain.

[e] Deformation measured perpendicular to the grain when the load is applied along the grain.

Q1/ From the figs. below, Draw **Front** ,**Top** and **Side views** for the assembly. (82 marks)

Q2/ Calculate and Sketch the following tolerances (18 marks)

A) $22C_{11}s_6$ B) $38H_{11}e_8$ C)$54NJs_7r_6$



Lecturer

Head of Department

قسم السيارات
س / ر

Ministry of Higher Education and Scientific Research
Foundation of Technical Education
Al-Furat Al-Awsat Technical University
Technical Engineering College / Najaf

Department: Automotive Technical Engineering
Stage: Second
Subject: Fluid Mechanics
Exam Time: Three Hours

The Final Exam Questions for the Academic Year 2015-2016
First Semester

Note: Answer Five Questions only, All Questions Have Same Marks

Q1/A- Define internal, external, and open-channel flows.

Q1/B- A 0.9-in-diameter glass tube is inserted into mercury, which makes a contact angle of 140° with glass. Determine the capillary drop of mercury in the tube at 68°F takes density $\rho = 847\ lbm/ft^3$, and the surface tension $\sigma_s = 0.03015\ lbm/ft$.

Q2/A- A room in the lower level of a cruise ship has a 30-cm-diameter circular window. If the midpoint of the window is 5 m below the water surface as shown in Fig. A2, take the specific gravity of seawater to be 1.025 determine:

(a) The average pressure on a surface (P_{av}).
(b) The hydrostatic force acting on the window (F_R).
(c) The pressure center (y_p).

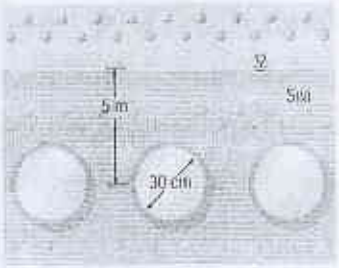


Fig.A2

Q2/B- A water tank is being towed by a truck on a level road, and the angle the free surface makes with the horizontal is measured to be 15° see fig. B2. Determine the acceleration of the truck.

Fig.B2

Q3/ A stirrer is used to mix chemicals in a large tank. The shaft power $\dot{W}$. supplied to the stirrer blades is a function of stirrer diameter D, liquid densityρ, liquid viscosity μ, and the angular velocity ω of the spinning blades. Use the method of repeating variables to generate a dimensionless relationship between these parameters $\dot{W} = f(\omega, \rho, \mu, D)$. Show all your work and be sure to identify your groups, modifying them as necessary.

Q4/A- A steady, incompressible, two-dimensional velocity field is given by the following components in the xy-plane:

$$u = 1.1 + 2.8x + 0.65y \qquad v = 0.98 - 2.1x - 2.8y$$

Calculate the acceleration field (find expressions for acceleration components a_x and a_y), and calculate the acceleration at the point (x, y) = (2, 3).

Q4/B- The air velocity in the duct of a heating system is to be measured by a Pitot-static probe inserted into the duct parallel to flow Fig.4. If the differential height between the water columns connected to the two outlets of the probe is 2.4 cm, determine the flow velocity . The air temperature and pressure in the duct are 45°C and 98 kPa, respectively, take the density of water $\rho_w = 1000\ kg/m^3$, and the gas constant of air is R=286.9 N.m/kg.K.

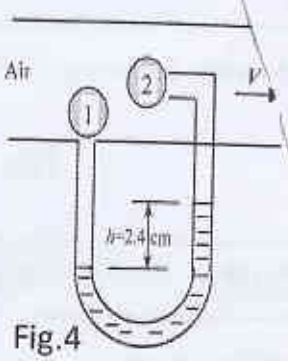


Fig.4

Q5/ Water accelerated by a nozzle to 15 m/s strikes the vertical back surface of a cart moving horizontally at a constant velocity of 5 m/s in the flow direction as shown in Fig.5. The mass flow rate of water is 25 kg/s. After the strike, the water stream splatters off in all directions in the plane of the back surface. ($\beta = 1$).

(a) Determine the relative velocity between the cart and the jet

(b) Determine the relative mass flow rate between the cart and the jet.

(c) Determine the force that needs to be applied on the brakes of the cart to prevent it from accelerating.

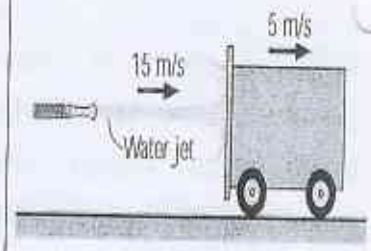


Fig.5

Q6/ Consider the flow of oil with $\rho = 894\ kg/m^3$, and $\mu = 2.33 kg/(m.s)$ in a 40-cm-diameter pipeline at an average velocity of 0.5 m/s. A 300-m-long section of the pipeline passes through the icy waters of a lake Fig. 6. Disregarding the entrance effects, determine:

a- The Reynolds number and show is the flow laminar or turbulent

b- The friction factor

c- The pressure losses by the flow of oil in the pipe.

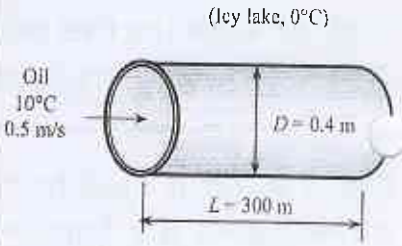
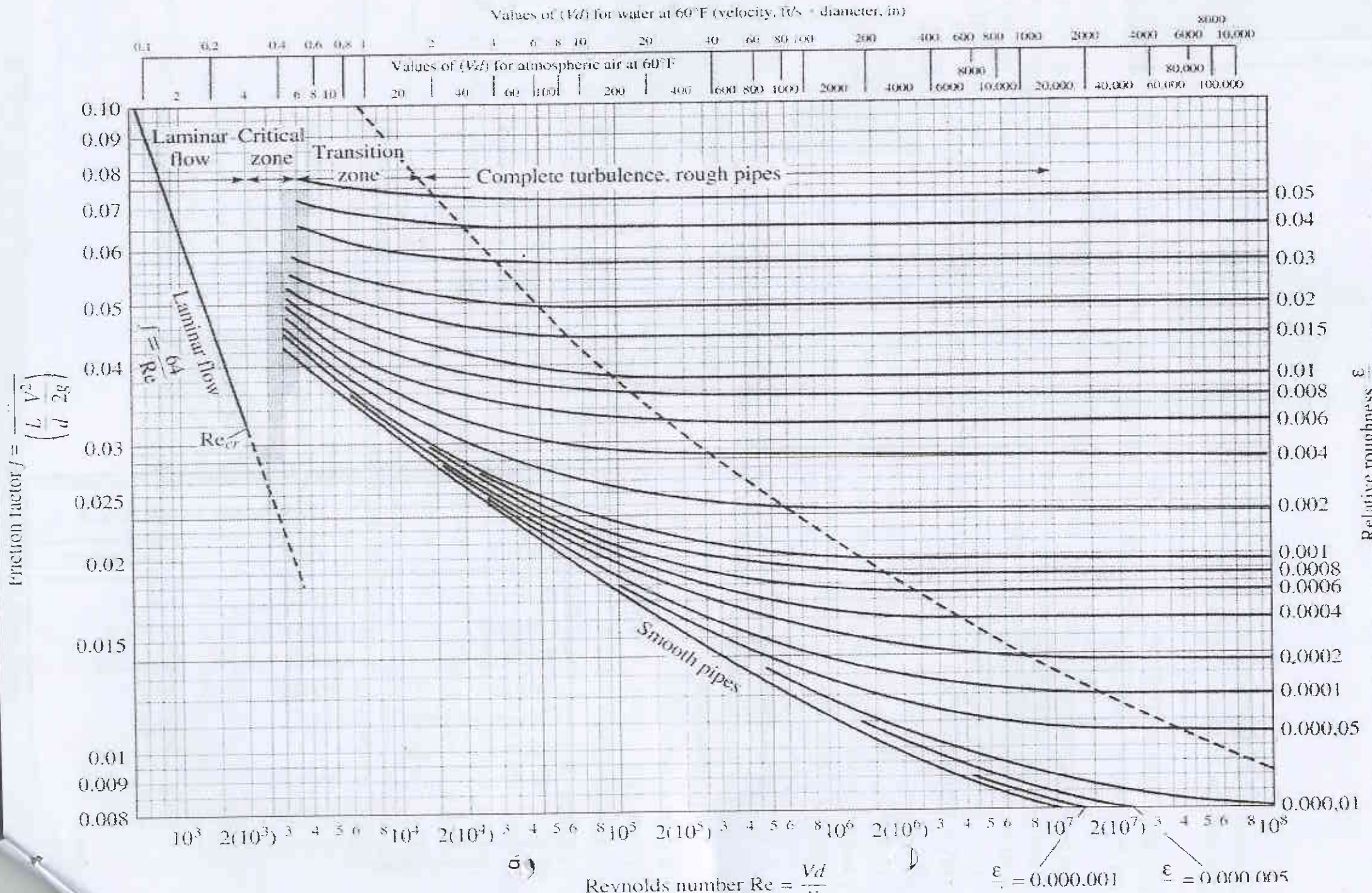


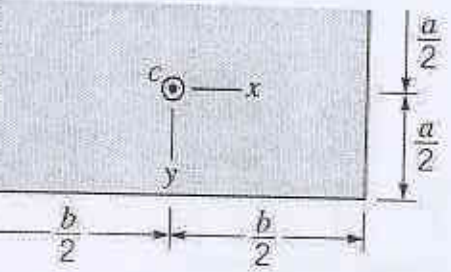
Fig.6

Good Luck

Lecturer
Dr. Dhafer Manea Hachim

Head of Department
Dr. Hiader H.


Values of (Vd) for water at 60°F (velocity, ft/s × diameter, in)
Values of (Vd) for atmospheric air at 60°F
Laminar flow
Critical zone
Transition zone
Complete turbulence, rough pipes
Laminar flow
$f = \frac{64}{Re}$
Re_{cr}
Smooth pipes
Friction factor $f = \frac{\left(\frac{L}{d}\right)}{\left(\frac{V^2}{2g}\right)}$
Reynolds number $Re = \frac{Vd}{\nu}$
$\frac{\varepsilon}{d} = 0.000,001$
$\frac{\varepsilon}{d} = 0.000,005$
Relative roughness $\frac{\varepsilon}{d}$

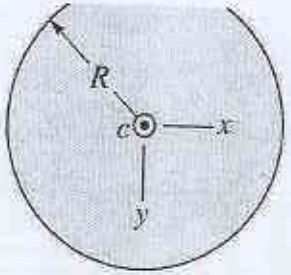


$$I_{xc} = \frac{1}{12}ba^3$$

$$I_{yc} = \frac{1}{12}ab^3$$

$$I_{xyc} = 0$$

(a)

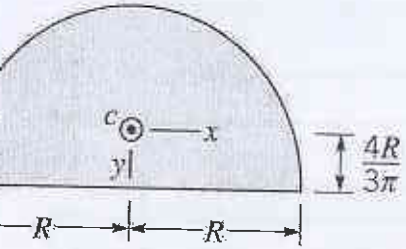


$$A = \pi R^2$$

$$I_{xc} = I_{yc} = \frac{\pi R^4}{4}$$

$$I_{xyc} = 0$$

(b)



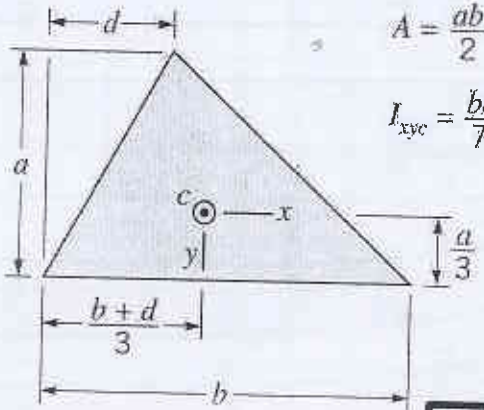
$$A = \frac{\pi R^2}{2}$$

$$I_{xc} = 0.1098R^4$$

$$I_{yc} = 0.3927R^4$$

$$I_{xyc} = 0$$

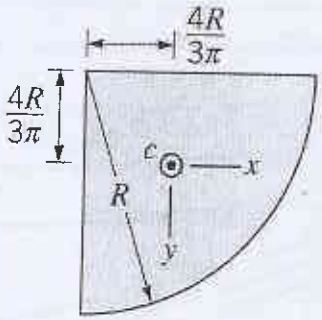
(c)



$$A = \frac{ab}{2} \qquad I_{xc} = \frac{ba^3}{36}$$

$$I_{xyc} = \frac{ba^2}{72}(b - 2d)$$

(d)



$$A = \frac{\pi R^2}{4}$$

$$I_{xc} = I_{yc} = 0.05488R^4$$

$$I_{xyc} = -0.01647R^4$$

(e)

Pipe	Equivalent Roughness, ε	
	Feet	Millimeters
Riveted steel	0.003–0.03	0.9–9.0
Concrete	0.001–0.01	0.3–3.0
Wood stave	0.0006–0.003	0.18–0.9
Cast iron	0.00085	0.26
Galvanized iron	0.0005	0.15
Commercial steel or wrought iron	0.00015	0.045
Drawn tubing	0.000005	0.00
Plastic, glass	0.0 (smooth)	

قسم السيارات

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

القسم : هندسة تقنيات السيارات
المرحلة: الثانية
المادة: Internal Combustion Engines
الوقت : ثلاثة ساعات
التاريخ : 2016/ 6 / 5

الامتحان النهائي للعام الدراسي 2015 - 2016

***Note:** Answer five Questions only*

Q1. A. Choose the correct answer which achieve the sentence of the following: ***(12 marks)***

1. If the ratio of bore to stroke length (B/S) is equal to one, the engine is called …….. .
   a. under square engine *b.* over square engine *c.* radial engine *d.* square engine
2. The valve that most commonly used in I.C engines called …….. .
   a. sleeve valve *b.* poppet valve *c.* rotary valve *d.* disc valve
3. SI engine operates on air-standard Otto cycle with compression ratio of 9 and k=1.4 . the indicated thermal efficiency of this engine ……. .
   a. 67% *b.* 58.4% *c.* 40.3% *d.* 51.4%
4. The crank angle (θ) equal to ……. . when the piston at bottom dead center
   a. 180° *b.* 90° *c.* 0° *d.* 45° .
5. Mass of oxygen required to completely burn 3kg of carbon is …… kg.
   a. 4 *b.* 6 *c.* 8 *d.* 1 .
6. If the equivalence ratio < 1 , the AF mixture is ……. .
   a. rich *b.* lean *c.* equivalence *d.* homogenous .

B. Compare between I.C engines and E.C Engines depending on the following properties :
1. Combustion 2.Temperature and pressure 3. Efficiency 4. Required equipment

(8 marks)

Q2. Prove that efficiency of Otto cycle $(\eta_t)_{Otto} = 1 - \frac{T_1}{T_2}$

(20 marks)

Q3. A 3.6-liter, V6 SI engine is designed to have a maximum speed of 7000 rpm. There are two intake valves per cylinder, and valve lift equals to 0.25 of valve diameter. Bore and stroke are related as S = 1.06 *B*. Design temperature of the air-fuel mixture entering the cylinders is 60°C. Solve the problem to choice the correct answer for the following:

1. The bore cylinder is
   a. 8.96 cm *b.* 8.96 mm *c.* 8.96 m *d.* 9.86 mm
2. Flow velocity through intake valve is
   a. 365.78 km/hr *b.* 365.78 m/sec *c.* 100.78 m/sec *d.* 653.78 m/sec
3. Average piston speed is
   a. 50.3 m/sec *b.* 50.3 km/sec *c.* 22.16 km/hr *d.* 22.16 m/sec
4. Ideal theoretical valve diameter is
   a. 3.21 cm *b.* 32.1 cm *c.* 3.21 m *d.* 32.1 m

(20 marks)

Q4. A 2.5 liters turbocharger engine with four cylinder operating at 4000 rpm. The engine exhaust condition are 1200 °C and 550 kpa , while the tailpipe pressure is 250 kpa and the actual tailpipe temperature is 950 °C . The isentropic efficiency of compressor is 95 % and the mechanical efficiency between turbine and compressor is 87.6 % .
Solve the problem to choice the correct answer for the following:

(20 marks)

1. The isotropic tailpipe temperature is
   a. 1175.89 °C *b.* 1175.89 K *c.* 1845.17 °C *d.* 1845.17 K
2. The isentropic efficiency of turbine is
   a. 84.14% *b.* 67.17 % *c.* 76.17 % *d.* 48.14 %
3. the overall efficiency of turbocharger is
   a. 80 % *b.* 75 % *c.* 70 % *d.* 90 %
4. the overall efficiency of turbocharger with 100 % mechanical efficiency is
   a. 97.93 % *b.* 93.93 % *c.* 99.93 % *d.* 79.93 %

Q5. Three I.C engines **A**,**B** and **C**. the engine A work on Otto cycle at maximum temperature 5000k, The engine B work on Diesel cycle with maximum temperature 3000k, the engine C work on Dual cycle with maximum temperature 4000k and heat added at constant volume 1500kJ/kg. Where all engine work at same compression ratio 9, same heat rejected 1200kJ/kg and the air inter to all engines at standard conditions.
Solve the problem to choice the correct answer for the following:

(20 marks)

1. The indicated thermal efficiency of engine A is
   a. 90.6 % *b.* 60.9 % *c.* 69 % *d.* 96 %
2. The indicated thermal efficiency of engine B is
   a. 47.69 % *b.* 49.67 % *c.* 46 % *d.* 64.96 %
3. The indicated thermal efficiency of engine C is
   a. 45.54 % *b.* 23.84 % *c.* 47.69% *d.* 55.54 %
4. Indicated thermal efficiency of engine C is ..... indicated thermal efficiency of engine B
   a. equal to *b.* grater than *c.* smaller than *d.* half of

Q6. Choose any **<u>two</u>** branches:

A. A 4.5 L V6 SI square engine design with three valves for inlet and two valves for exhaust The maximum revolution per minute is 7500 , the speed of sound at inlet 360 m/sec .
Determine the exhaust valve diameter. ***(10 marks)***

B. List in the sectors of energy use in the world with details. ***(10 marks)***

(10 marks)

C. For an engine with crank shaft offset (a), connecting rod length (r), crank angle (θ) and distance between crank axis and wrist pin axis (s). prove that $s = a\cos\theta + \sqrt[2]{r^2 - a^2\sin^2\theta}$

(10 marks)

"ALL THE BEST"

مدرس المادة
م. م. بلاسم عبد الأمير القريشي

رئيس القسم
د. حيدر حسن العبدلي

قسم السيارات
س/ ٤

Subject: Automobile Electricity
Class: 2nd
Time: 3 hours

Ministry of Higher Education
and Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College / Najaf
Final Exam 2015-2016

Date: 6/2016

Note: answer five questions only

Q.1/Define **five** only:

1- Battery plates 2- The stator 3- Ballast resistor
4- Diodes 5- Starter motor 6- High beams light

Q.2 Choose the correct answer (20 marks)

1- The ..... of a particular battery are determined by how much current it can produce and how long it can sustain this current.

a) volume b) rating c) size d) conductivity

2- The charging system voltage is set to the value of..... ± 0.2 v then there can be no risk of overcharging the battery for a 12 V system.

a) 13.2 b) 10.2 c) 14.2 d) 12.2

3- The ..... is a spring-loaded switch, used to controls the starting, ignition and accessories.

a) solenoid b) relay c) voltage regulator d) ignition switch

4- Chopper is a part of ..... pulse generator which used to generate a signal to ignition system.

a) Hall-effect b) Inductive c) Optical d) Contact breaker

5- Compared to a conventional headlamp, a halogen headlamp increases light output by about ..... %, with no increase in current draw.

a) 15 b) 25 c) 30 d) 20

Q.3/A/ Draw the complete circuit of electronic voltage regulator. (12 M)

Q.3/ B/ What are the main components of alternator? (8 M)

Q.4/A/ At high engine rpm the ignition timing (spark) needs time advanced. Why? (10 M)

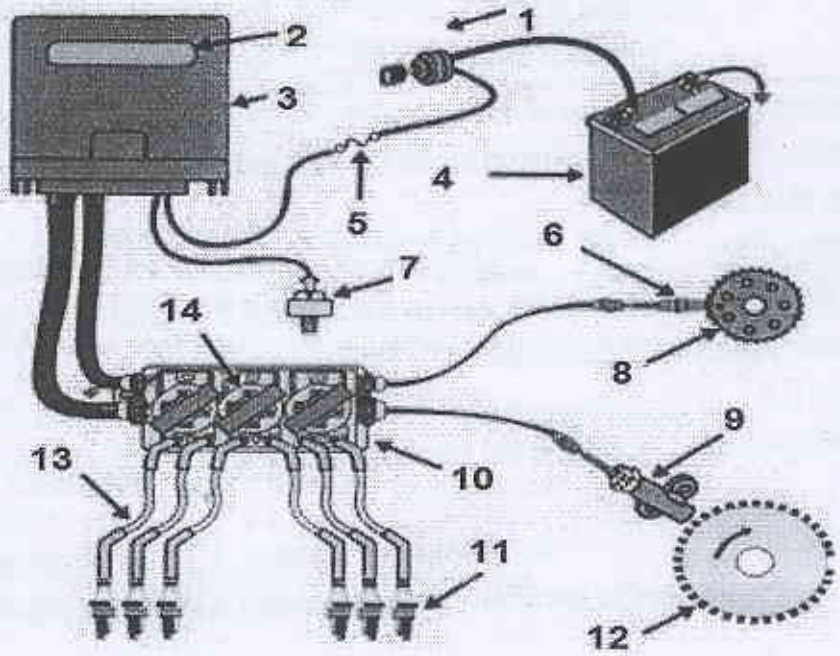
Q.4/B/ Explain the operation of Turn Signal System. (10 M)

Q.5 What are the functions of the following: (20 Marks)

1- Ignition coil 2- Battery 3- Electrolyte 4- Transistors 5-Emergency Light Systems

Q.6/A/ Explain in detail the operation of starter motor (10 M)

Q.6/B/ Name the parts in the Figure in page 2. (10 M)



Examiner
Ahmed Dheyaa Rabee

Head of Department
Dr. Haider Hasan

قسم السيارات
ك/س

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Tech. Eng. College – Najaf/Automobile Tech. Eng. Dept.
Final examination 2015-2016

Subject: Mathematics **Class: 2st year**
Time: 3 hours **Date: / 5 / 2016**

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

---

Q1: a) If $Z = x^3 + y^5 + 3x^2y^4 + \text{Sin}(\frac{y}{x})$ find z_x , z_y (10 Degree)

Q1: b) If $xyz + x^3 + z^4 = 7$ Then show that $\left(\frac{\partial z}{\partial x}\right)_y \cdot \left(\frac{\partial x}{\partial y}\right)_z \cdot \left(\frac{\partial y}{\partial z}\right)_x = -1$ (15 Degree)

Q2: a) Solve the following equation: $\frac{dy}{dx} = \frac{x^3y^4 - 2y}{x}$ (10 Degree)

Q2: b) Solve $\frac{dy}{dx} = \frac{x\sqrt{1-y^2}}{1+x^2}$ when x=0 , y=1 (15 Degree)

Q3: a) Solve $e^x \cos y\, dx + (1+e^x)\sin y\, dy = 0$ (10 Degree)

Q3: b) Solve $\int x^2 \sin x\, dx$ (15 Degree)

Q4: a) If $y = e^{x^2+x-1}$ prove that $3y'' - 5y' + y = \frac{5}{e}$ at x=0 (10 Degree)

Q4: b) Find x and y if: (15 Degree)

$$A = \begin{bmatrix} \sin x & 2 \\ -3 & \sin y \end{bmatrix} \; ; \; B = \begin{bmatrix} 6 \\ 1 \end{bmatrix} \; ; \; C = A.B = \begin{bmatrix} 5 \\ -17 \end{bmatrix}$$

♣♣ Good Luck ♣♣

Dr. Eng. Mahdi Hatf Kadhum
Examiner