جـــــمهوريـــــة العـــــراق

وزارة التعليم العالي و البحث العلمي

جامعة الفرات الأوســـط التقنية

الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات السيارات

المرحلة الثانية

أسئلة الامتحان النهائي للعام الدراسي

2015-2016

الدور الثاني

شعبة ضمان الجودة و الأداء الجامعي

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 (20 Marks)

Q1: Choose the appropriate answer (10 Marks)

(1) The stress concept relies on:

(A) Continuum elements. (B) Uniform distribution load. (C) Regulation body with applied load.

(D) Irregulation body with applied load.

(2) Shear strain may be:

(A) Normal angle. (B) Inclined angle. (C) Radial deformation. (D) Small displacement.

(3) If we have a vertical-rigid bar, the useful analysis of load is:

(A) Whole body.   (B) Divide body.   (C) A&B.   (D) Non all.

(4) Allowable stress of the body can be recognized by:

(A) Normal load. (B) Area.   (C) Internal load.   (D) External load.

(5) The distance between deflected area and less deflected area based on Saint-Venant's principles are:

(A) $\sigma_{Max} = 1.02 \ \sigma_{Av}$. (B) $\sigma_{Max} \simeq 1.02 \ \sigma_{Av}$. (C) $\sigma_{Max} \approx 1.05 \ \sigma_{Av}$. (D) $\sigma_{Max} = 1.04 \ \sigma_{Av}$.

Q2: What are the parameters replacing in circular shaft instead of axial state that is producing by Saint-Venant's? Prove this mathematically. (10 Marks)

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Group (B): Mechanics of Materials Problems

(80 Marks)

Q1: The state of stresses is referring to in figure (1) on the element. Determine (a) the principal stress and (b) the maximum in-plane shear stress and average normal stress at the point (c) the orientation of the element in each case. Sketch the results on each element. (30 Marks)
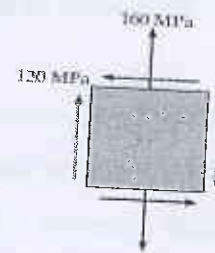

Figure (1) Rotating element

Q2: The gears attached to the fixed-end Steel shaft are subjected to the torques shown in figure (2). If the shear modulus of elasticity is (80 GPa) and the shaft has a diameter of 14 mm, determine the displacement of the tooth P on gear A. The shaft turns freely within the bearing at B. (20 Marks)
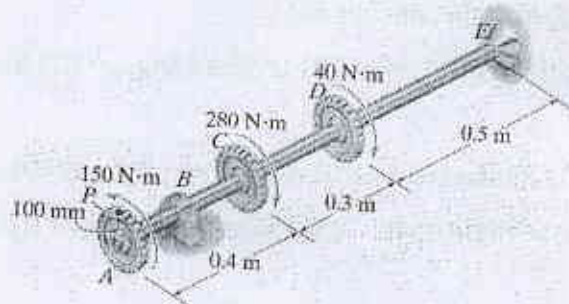

Figure (2) Fixed Steel shaft

Q3: Rigid beam AB rests on the two short posts shown in figure (3). AC is made of Steel and has a diameter of 20 mm, and BD is made of Aluminum and has a diameter of 40 mm. Determine the displacement of point F on AB if a vertical load of 90 kN is applied over this point. Take E_{st} = 200 GPa, E_{al} = 70 GPa. (30 Marks)
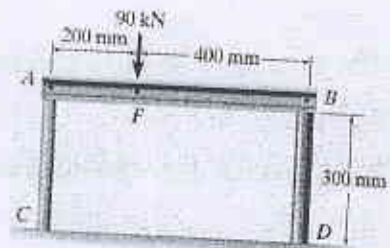

Figure (3) Beam supported by two posted

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

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وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط
الكلية التقنية ـ نجف

القسم : قسم الاتصالات / السيا
المرحلة :الثانية
المادة: حاسبة
وقت الامتحان: ثلاث ساعات
التأريخ:

الامتحان النهائي للعام الدراسي 2015 – 2016

Answer All Questions

Q1: What is the result of execution of the following functions: ((choose five only)) (15 deg.)

1. math.Sqrt(81).
2. math.Pow(3, 5).
3. math.Round(676.37)
4. math.max (785, 960).
5. math. min(21, 8) .
6. math .abs (5).

****

Q2: Define the following Internet terms : (24 deg.)

. HTML   2. TCP   3. Packet   4. ARP   5. Encryption   6. FTP
****

Q3: Give the correct representation in visual basic for the following equations: (16 deg.)

1. $\sin(x)+\tan(y)$
2. $\cos(w+4)$.
3. $93+ \tan(45)$.
4. $e^{2t} - 2$.
****
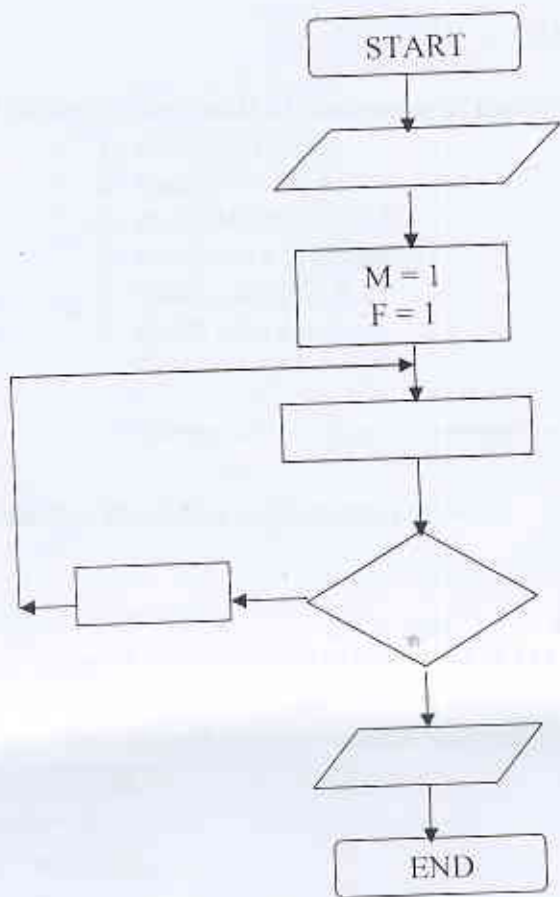
Q4: Do <u>only one</u> of the following : (20 deg.)

1. Write complete program to display the elements of main diagonal.
2. Write complete program to find the maximum number in matrix.

****

Q5: Answer by True or False and correct statement : (15 deg)

1. The variable with name (MA&) is valid
2. MsgBox(Math.Sqrt(49)) will give 7 as result
3. This code is a correct declaration for the message box   msgbox ("Input your grade:")
4. This code is a correct declaration for variable (dim x as integer)
5. To make button visible in your program this code (button1.visible =true) is used.

****

Q6: Complete the flowchart for computing factorial N Where   **(10 deg.)**

N! = 1 × 2 × 3 × ...... N from the following statement .


```
START
  ↓
 _____  (READ N)
  ↓
M = 1
F = 1
  ↓
 _____
  ↓
 ◇ (decision)
  ↓
 _____  (PRINT F)
  ↓
END
```

1. PRINT F
2. IS M=N
3. F = F * M
4. READ N
5. M=M+1

****
****

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

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

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Q1/A-Define stress, normal stress, shear stress, and pressure.

Q1/B-The water in a tank is pressurized by air, and the pressure is measured by a multifluid manometer as shown in Fig.1. Determine the gage pressure of air in the tank if h_1= 0.2 m, h_2 = 0.3 m, and h_3 = 0.46 m. Take the densities of water, oil, and mercury to be 1000 kg/m^3, 850 kg/m^3, and 13,600 kg/m^3, respectively.

Q2/A- A 10-kg block slides down a smooth inclined surface as shown in Fig.2. Determine the terminal velocity of the block if the 0.1-mm gap between the block and the surface contains oil with a dynamic viscosity (μ=0. 38 $N.s/m^2$). Assume the velocity distribution in the gap is linear, and the area of the block in contact with the oil is 0.1 m^2.

Q2/B- A compressed air tank contains 5 kg of air at a temperature of 80 °C. A gage on the tank reads 300 kPa. Determine the volume of the tank (take R=286.9 J/kg.K).
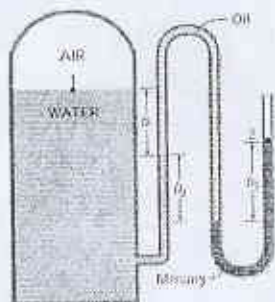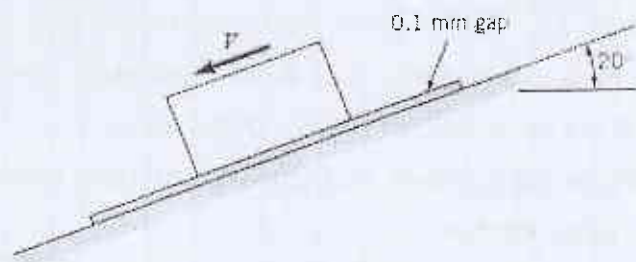

Fig. 1

Fig.2

Q3/Water flows through the pipe contraction shown in Fig. 3 .For the given 0.2-m difference in the manometer level, determine the flow rate as a function of the diameter of the small pipe, D.
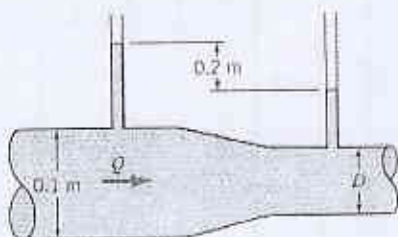

Fig. 3

A-1

Q4/A horizontal water jet impinges against a vertical flat plate at 30 ft/s and splashes off the sides in the vertical plane. If a horizontal force of 350 lbf is required to hold the plate against the water stream (Fig. 4);determine the volume flow rate of the water by using the momentum equation for steady one-dimensional flow in the x direction. (Take the momentum-flux correction factor $\beta = 1$ and density of water $\rho = 62.4 \; Ibm/ft^3$)
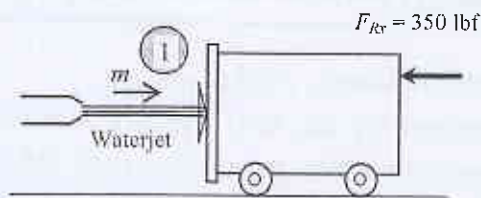

Fig. 4

Q5/ Periodic Kármán vortex street is formed when a uniform stream flows over a circular cylinder. Use the method of repeating variables to generate a dimensionless relationship for Kármán vortex shedding frequency f_k as a function of free stream speed V, fluid density ρ, fluid viscosity μ, and cylinder diameter D. $(f_k = f(V, \rho, \mu, D)$. Show all your work.

Q6/Water at 15°C $(\rho = 999.1 \; kg/m^3$, and $\mu = 1.138 \times 10^{-3} kg/(m.s))$ is flowing steadily in a 30-m-long and 4-cm-diameter horizontal pipe made of stainless steel at a rate of 8 L/s as shown in Fig. 6. Determine:
(a) The Reynolds number and show is the flow laminar or turbulent
(b) The friction factor
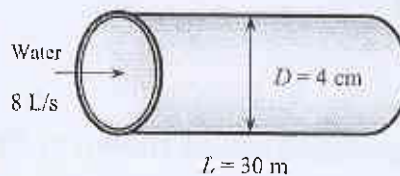(c) The pressure drop, and
(d) The head loss.

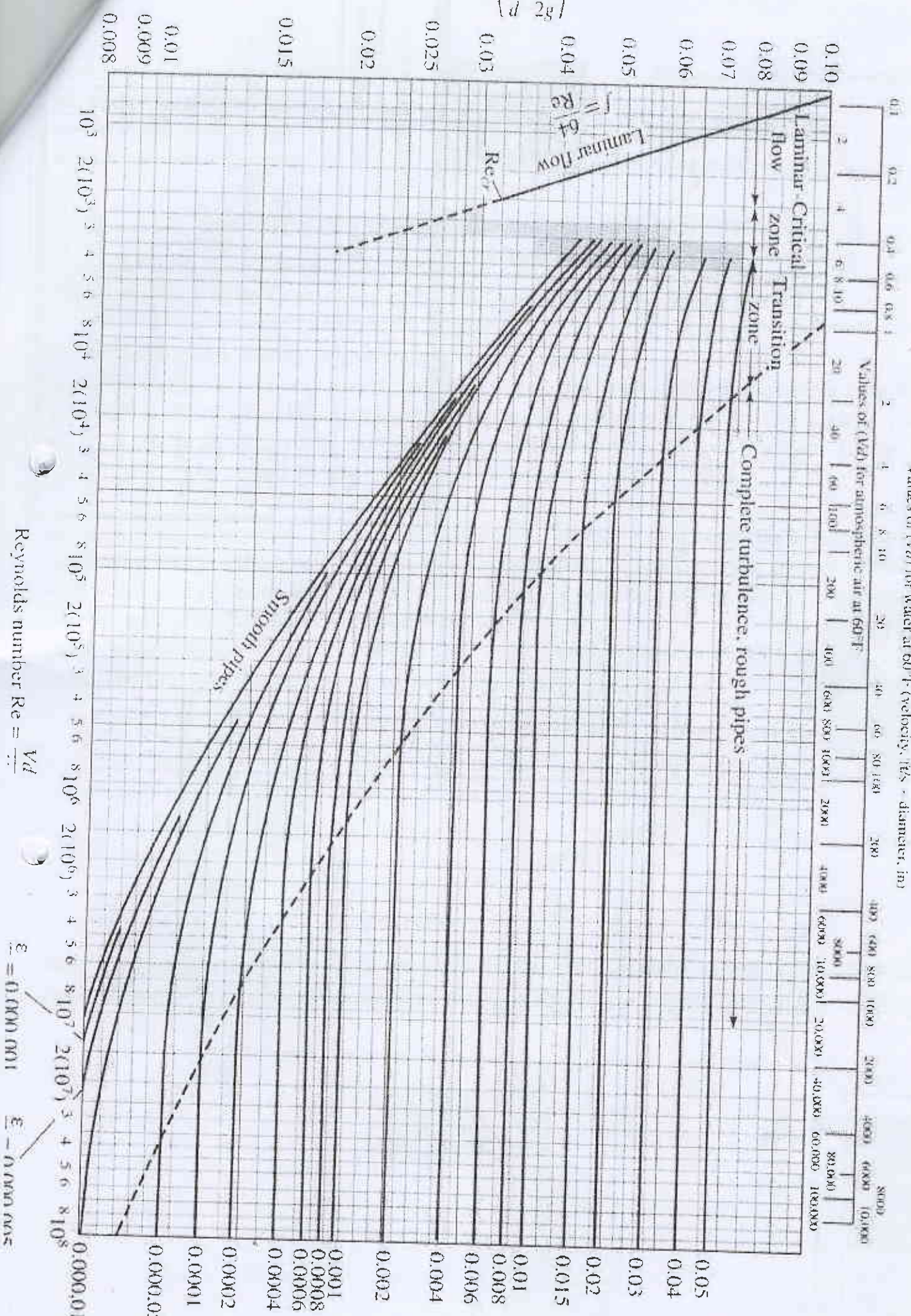Fig. 6

Good Luck

Dhafe

Lecturer
Dr. Dhafeer M. AL-Shamkhi

A-2

Head of Department
Dr. Ali Shakir Baqir

Moody diagram — Friction factor $f = \dfrac{h_L}{\left(\dfrac{L}{d}\dfrac{V^2}{2g}\right)}$ versus Reynolds number $Re = \dfrac{Vd}{\nu}$ and relative roughness $\dfrac{\varepsilon}{d}$.

$\dfrac{a}{2}$ $\dfrac{a}{2}$
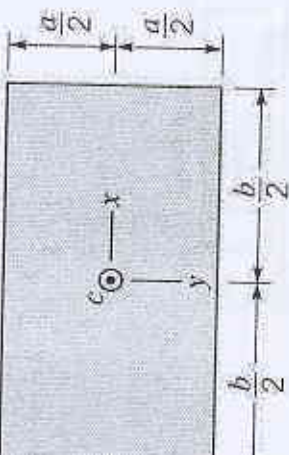
$A = ba$

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

$I_{yc} = \dfrac{1}{12}ab^3$
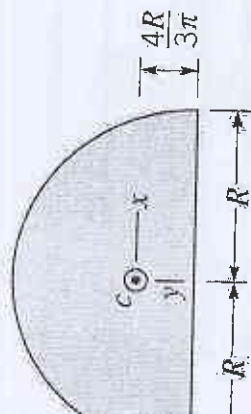
$I_{xyc} = 0$

$\dfrac{b}{2}$ $\dfrac{b}{2}$

(a)
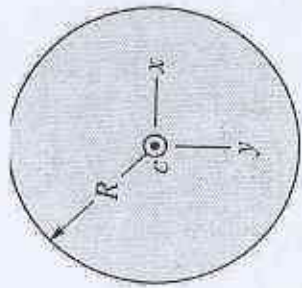
$A = \pi R^2$

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

$I_{xyc} = 0$

(b)

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

$I_{xc} = 0.1098R^4$

$I_{yc} = 0.3927R^4$

$I_{xyc} = 0$

$\dfrac{4R}{3\pi}$

R R

(c)

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

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

$\dfrac{a}{3}$

d a b $\dfrac{b+d}{3}$

(d)

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

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

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

$\dfrac{4R}{3\pi}$ $\dfrac{4R}{3\pi}$ R

(e)

Equivalent Roughness, ε

Pipe	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 sta $Mess$	0.00015	0.002
or wrought iron	0.00015	0.045
Drawn tubing	0.000005	0.0015
Plastic, glass	0.0 (smooth)	0.0 (s

قسم السيارات
س/ ج

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 $Z = 2x^2 + 5y^5 + \sin x - \cos y \, x$ find z_x , z_y (10 Degree)

Q1: b) Solve $5 \, y \, y'' + 10 \, y^2 = 0$ when: (15 Degree)
x=0 , y=1
x=0.5 , y=2

Q2: a) Solve $\dfrac{dy}{dx} = \cos(x + y)$ (10 Degree)

Q2: b) Solve $6 \, y'' - 4 \, y' - 2 \, y = x^3 + 3x^2 - 2$ (15 Degree)

Q3: a) Solve $\dfrac{dy}{dx} = e^{2x+y}$ (10 Degree)

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

Q4: a) If $y = \dfrac{3x + 1}{(x-1)^2}$ prove that $(x-1)^2 \, y'' + 4 \, (x-1) \, y' + 2y = 0$ (10 Degree)

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

$$A = \begin{bmatrix} \cos x & 2 \\ -1 & \cos y \end{bmatrix} \; ; \; B = \begin{bmatrix} 8 \\ 2 \end{bmatrix} \; ; \; C = A.B = \begin{bmatrix} 10 \\ -8 \end{bmatrix}$$

♣♣ Good Luck ♣♣

Dr. Eng. Mahdi Hatf Kadhum
    Examiner

Subject: Automobile Electricity	Ministry of Higher Education	
Class: 2nd	and Scientific Research	Date: 6/2016
Time: 3 hours	Al-Furat Al-Awsat Technical University	
	Engineering Technical College / Najaf	
	Final Exam 2015-2016	

Note: answer five questions only

Q.1/Define five only: (20 marks)

1) PTC resistor	2) The rotor	3) self-discharge
4) pinion gear	5) Dwell-angle	6) High beams lights

Q.2 Choose the correct answer (20 marks)

1- In general the accepted of maximum volt drop of only ………. V should be allowed between the battery and the starter when operating.

a) 0.5　　　　　　b) 1　　　　　　c) 5　　　　　　d) 1.5

2- - The electrical pressure measured by ……………..

a) volt　　　　　　b) ampere　　　　　　c) ohm　　　　　　d) Pascal

3- Some larger trucks and buses use a 24 volt electrical system. In this case,12 cells of batteries are connected in ……….. to give the 24 volts.

a) compound　　　　b) parallel　　　　c) series　　　　d) side to side

4- The component most suitable for voltage rectification is the……………..

a) transistor　　　b) silicon diode　　　c) capacitor　　　d) Zener diodes

5- A typical low beam bulb power is …….. watts.

a) 60　　　　　　b) 65　　　　　　c) 40　　　　　　d) 45

Q.3/A/ What is the usage of the four-diode bridge rectifier? (10 M)

Q.3/B/ What are the parameters more effects on 'mutually induced' voltage? (10 M)

Q.4/A/ The four main types of motor are referred to as shunt wound, series wound, compound wound and permanent magnet excitation. Draw an electrical circuit for each one. (12 M)

Q.4/B/ Numerate the types of electrical circuits. (8 M)

Q.5/ What are the functions of each one: (20 marks)

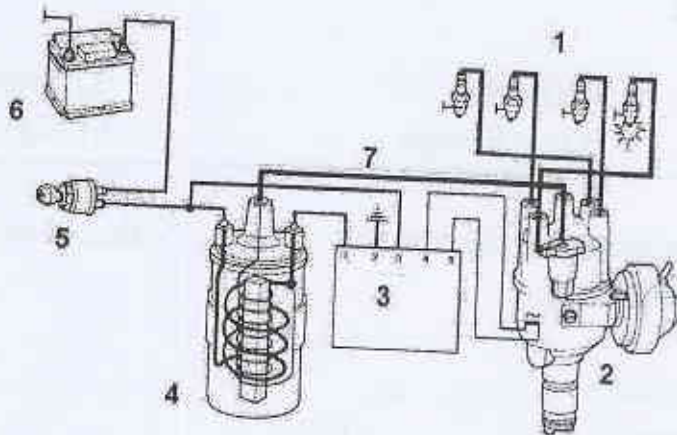|		
1- Hall effect pulse generator	2- capacitor	3- Zener diodes
4- Electrolyte	5- twin cooling fans	

Q.6/A/ How are the battery capacity measured? Explain in detail. (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

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

قسم السيارات
حرارس

الامتحان النهائي للعام الدراسي 2015 - 2016

Note: *Answer five Questions only*

(8 marks)

Q1. A. Fill in the blanks with appropriate for **four** of the following:

1. Mass of oxygen required to completely burn 4kg of carbon is ...... kg.
2. If the intake air temperature is 32°C , the air intake velocity is ....
3. The type of combustion that occurs in IC engine is called ....
4. Producing of heat or energy from fuel by .... process.
5. The crank angle (θ) equal to .... when the piston at bottom dead center

B. An automobile engine operates on Otto cycle having a compression ratio of 7 . If the specific heat at constant volume increases by 1% , What is the percentage change in the cycle efficiency.

(12 marks)

Q2. V6 Petrol engine has 3 liter. It is operating on a four-stroke cycle at 3600 rpm. At this speed combustion ends at 20° aTDC. The compression ratio is 9.5.The length of connecting is 16.6 cm, where the engine is square. Solve the problem to choice the correct answer for the following:

1. The stroke length is
   a. 8.6 mm   *b.* 8.6 m   *c.* 8.6 cm   *d.* 6.8 cm

2. Average piston speed is
   a. 10.32 m/s   *b.* 1.032 m/s   *c.* 10.32 km/s   *d.* 10.32 km/hr

3. Piston speed at the end of combustion is
   a. 9.86 m/s   *b.* 8.69 m/s   *c.* 6.89 m/s   *d.* 6.89 km/s

4. Distance the piston has traveled from TDC at the end of combustion is
   a. 3 mm   *b.* 0.3 m   *c.* 3 cm   *d.* 0.3 cm

(20 marks)

Q3. Choice any **two** branches:

A. Explain the theoretical valves timing diagram for four stroke cycle engine

(10 marks)

B. What are the simplifying assumptions to make the analysis of the engine cycle much more manageable for study.

(10 marks)

C. List in the types of combustion processes with details.

(10 marks)

Q4. CI engine for small truck is operating on air standard Dual cycle with compression ratio 18. Due to structural limitation, maximum allowable pressure in the cycle is 9 MPa. light Diesel fuel is used with calorific value 42500 kJ/kg. The AF ratio is 18.518. Combustion efficiency is -100% .Cylinder conditions at the start of compression are 323 k and 98 kPa. Take k= 1.35. Solve the problem to choice the correct answer for the following:

1. Maximum indicated thermal efficiency possible with these conditions.
   - a. 50.3 %
   - b. 60.3 %
   - c. 52.9 %
   - d. 55.3 %

2. Peak cycle temperature in kelvin under conditions of point 1.
   - a. 3050.26
   - b. 5030.26
   - c. 3500
   - d. 5300.26

3. Minimum indicated thermal efficiency possible with these conditions.
   - a. 52.9 %
   - b. 60.3 %
   - c. 62.9 %
   - d. 50.3 %

4. Peak cycle temperature in kelvin under conditions of point 3.
   - a. 5929.62
   - b. 3500
   - c. 3050.26
   - d. 2959.62

(20marks)

Q5. . Prove that efficiency of Dual cycle $(\eta_t)_{Dual} = 1 - \dfrac{(\alpha \beta^k - 1)}{r_c^{k-1}\,[(\alpha - 1) + \alpha k(\beta - 1)]}$

(20 marks)

Q6. 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. 653.78 m/sec
   - c. 100.78 m/sec
   - d. 365.78 m/sec

3. Average piston speed is
   - a. 50.3 m/sec
   - b. 22.16 m/sec
   - c. 22.16 km/hr
   - d. 50.3 km/sec

4. Ideal theoretical valve diameter is
   - a. 3.21 m
   - b. 32.1 cm
   - c. 3.21 cm
   - d. 32.1 m

(20 marks)

GOOD LUCK

مدرس المادة
م. م. بلاسم عبد الأمير القريشي

رئيس القسم
د. حيدر حسن العبدلي