جـــــمهوريـــــة العـــــــراق

وزارة التعليم العالي و البحث العلمي

جامعة الفرات الأوســـــط التقنية

الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات السيارات

المرحلة الثانية

أسئلة الفصل الأول للعام الدراسي

٢٠١٥-٢٠١٦

شعبة ضمان الجودة و الأداء الجامعي

Ministry of Higher Education and Scientific Research

Foundation of Technical Education

Al-Furat Al-Awsat Technical University

Technical Engineering College / Najaf

Departments: Automotive Technical Engineering

& Aeronautical Technical Engineering

Stage: Second

Subject: Fluid Mechanics

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

Note: Answer All Questions.

Q1/A- An 8-ft-long tank open to the atmosphere initially contains 3-ft-high water. It is being towed by a truck on a level road. The truck driver applies the brakes and the water level at the front rises 0.5 ft above the initial level as shown in Fig. 1A. Determine the deceleration of the truck. (5 marks)

B- Define incompressible flow and incompressible fluid. Must the flow of a compressible fluid necessarily be treated as compressible? (5 marks)

Q2/A- All fluids in the Fig. 2A are at 20°C. If atmosphere pressure=101.33 kPa and the bottom pressure is 242 kPa absolute, what is the specific gravity of fluid X?
(Note at this temperature the specific weight for SAE 30 oil is 8720 N/m, water 9790 N/m^3, and mercury 133100 N/m^3.) (6 marks)

B- What is the no-slip condition? What causes it? (4 marks)

Q3/A- A 2-ft-thick block constructed of wood (SG =0.6) is submerged in oil (SG =0.8), and has a 2-ft-thick aluminum (specific weight =168 lb/ft^3) plate attached to the bottom as indicated in Fig. 3A. Determine completely the force required to hold the block in the position shown. Locate the force with respect to point A. (10 marks)

B- Define the following terms: (10 marks)

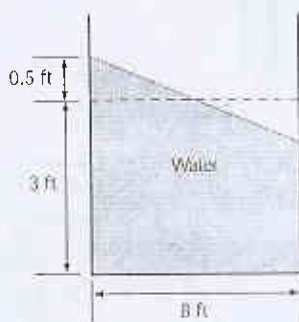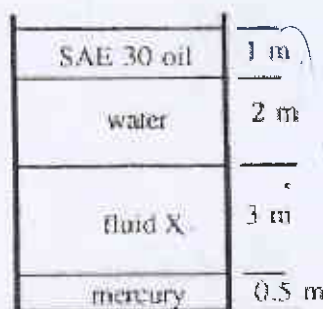   1. A fluid   2. Accuracy error   3. Specific gravity   4. Viscosity   5. Eulerian method

Fig. 1A

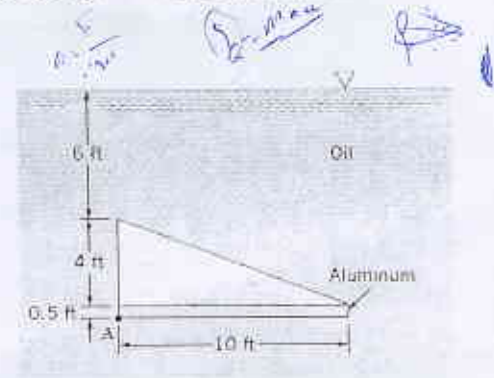| SAE 30 oil | 1 m |
water	2 m
fluid X	3 m
mercury	0.5 m

Fig. 2A

Fig. 3A

Q4/A- What is vapor pressure? How is it related to saturation pressure? (5 marks)

B- A 12-in.-diameter circular plate is placed over a fixed bottom plate with a 0.1-in. gap between the two plates filled with glycerin as shown in Fig. 4B. Determine the torque required to rotate the circular plate slowly at 2 rpm. Assume that the velocity distribution in the gap is linear and that the shear stress on the edge of the rotating plate is negligible. (10 marks)
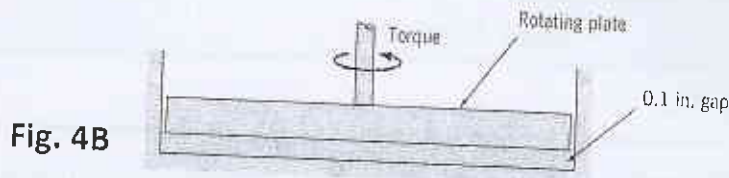

Fig. 4B

Q5/A- Define the resultant hydrostatic force acting on a submerged surface, and the center of pressure. (8 marks)

B- A velocity field is given by $V = x\vec{i} + x(x-1)(y+1)\vec{j}$, where u and v are in ft/s and x and y are in feet. Plot the streamline that passes through x=0 and y=0. Compare this streamline with the streakline through the origin. (12 marks)

Q6/A- The homogeneous gate shown in Fig.6A consists of one quarter of a circular cylinder and is used to maintain a water depth of 4 m. That is, when the water depth exceeds 4 m, the gate opens slightly and lets the water flow under it. Determine the weight of the gate per meter of length. (15 marks)

B- The cylindrical tank with hemispherical ends shown in Fig. 6B contains a volatile liquid and its vapor. The liquid density is 800 kg/m^3, and its vapor density is negligible. The pressure in the vapor is 120 kPa (abs), and the atmospheric pressure is 101 kPa (abs). Determine: (a) the gage pressure reading on the pressure gage; and (b) the height, h, of the mercury manometer, (take $\gamma_{Hg} = 133000 \frac{N}{m^3}$). (10 marks)
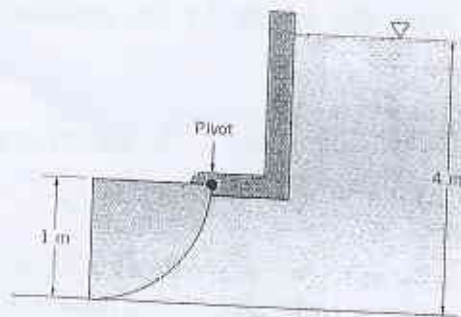

Fig. 6A

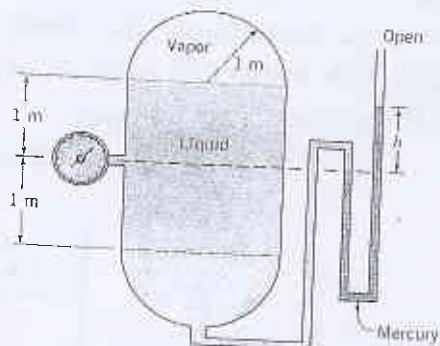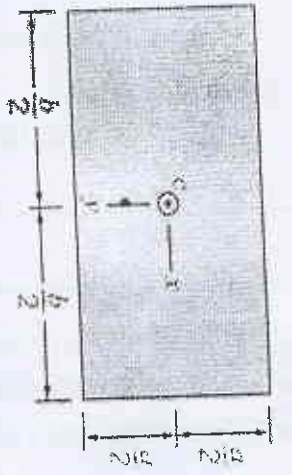**Fig. 6B**

Good Luck

Lecturer
Dr. Dhafeer M. AL-Shamkhi

2

Head of Department
Dr. Hiader H.

(a) Rectangle

$$A = bd$$
$$I_{xx} = \frac{1}{12}bd^3$$
$$I_{yy} = \frac{1}{12}db^3$$
$$I_{xy} = 0$$
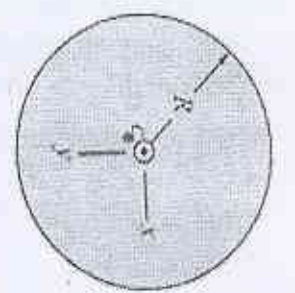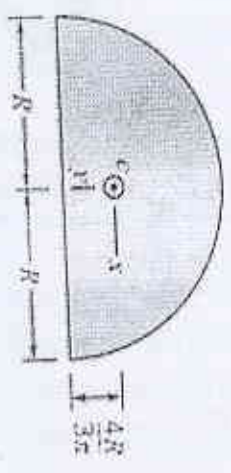
(b) Circle

$$A = \pi R^2$$
$$I_{xx} = I_{yy} = \frac{\pi R^4}{4}$$
$$I_{xy} = 0$$

(c) Semicircle

$$A = \frac{\pi R^2}{2}$$
$$I_{xx} = 0.1098R^4$$
$$I_{yy} = 0.3927R^4$$
$$I_{xy} = 0$$

(d) Triangle

$$A = \frac{ab}{2}$$
$$I_{xx} = \frac{ba^3}{36}$$
$$I_{xy} = \frac{ba^2}{72}(h - 2d)$$
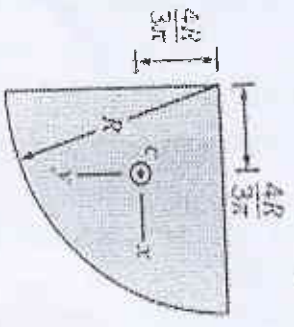
(e) Quarter circle

$$A = \frac{\pi R^2}{4}$$
$$I_{xx} = I_{yy} = 0.05488R^4$$
$$I_{xy} = -0.01647R^4$$

FIGURE 2.18 Geometric properties of some common shapes.

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Technical College Engineering - Annajaf

Dep. : Automotive & Aeronautical Eng. Techniques.

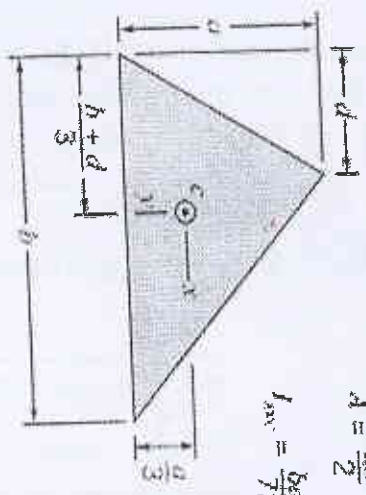Grade Level: 2nd.

Object: Strength of Materials.

Exam Time: 2 hours.

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Note: Endeavor All Questions Using prescribed tables

Group (A): Mechanics of Materials Conceptions (40 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: Interpret the following cases: (10 Marks)

(1) Normal load on cross-sectional area.　　　　(4) 0.2% true strain.

(2) Tangential load on cross-sectional area.　　　(5) Necking ratio (R/a).

(3) Strain gauge normal to dummy resistance.

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****

Q3: What is the effect of the following states?

(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.

(20 Marks)

Group (B): Mechanics of Materials Problems

(60 Marks)

Q1: The resilience of specimen shows in stress-strain diagram in figure (1) is (0.15915 ksi) and Young's modulus elasticity (127.32 ksi). It is having a length of (5 in) and diameter of (2 in) with approximated axial displacement (0.25 in). The tester-man adds plasticizers to polyvinyl chloride to reduce stiffness of it. Determine one of three types used to manufacture of it and limited axial load. (10 Marks)
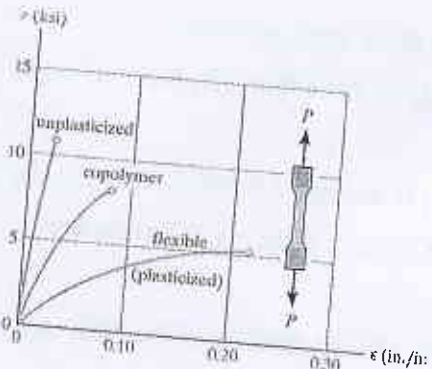
Figure (1) Specimen Testing

Q2: The figure (2) shows beam raised on three post made of (Ti-6Al-4V) and (6061-T6) respectively, The gap between the beam and (6061-T6) post is (0.18 mm) from the length of (Ti-6Al-4V) post. Fill the blank in the below tables, if the applied load on the beam is (400 kN): (40 Marks)

1- Statically condition:

N	Post alloy	Post Area (mm²)	Reactions (kN)	Stress (MPa)
1	Ti-6Al-4V	500		
2	6061-T6	400		
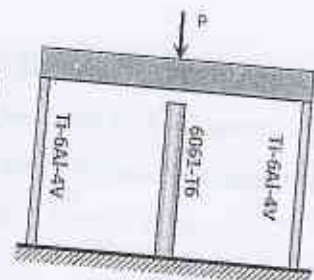
Figure (2) Three post raised beam

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Grade Level: 2nd.

Object: Strength of Materials.

Exam Time: 2 hours.

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1- Thermal condition, If the increased temperature (85 °C):

N	Post alloy	Post Area (mm^2)	Reactions (kN)	Stress (MPa)
1	Ti-6Al-4V	500		
2	6061-T6	400		

Q3: Determine the maximum allowable torque **T** that can be transmitted by the joint as shown in figure (3). The shear pin **A** has a diameter of (25 mm) and it made from a material having a failure shear stress of ($\tau_{fail} = 150$ MPa). Apply a factor of safety of 3 against failure. (10 Marks)

Figure (3) Join connected by pin

GOOD LUCK

Examiner	Head of Aeronautical Dep.	Head of Automobile Dep.
A.Lecturer: Mohammed A. Abass	A. Prof. Dr. Ali S. Baqir	Dr. Haider H. Al-Abdili

القسم : هندسة الاتصالات
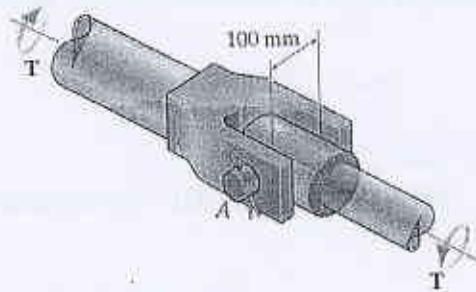المرحلة :الثانية
المادة: حاسبة
وقت الامتحان: ساعتان
التاريخ: ٢٠١٦ / ٢ /٢٤

وزارة التعليم العالي والبحث العلمي
هيئة التعليم التقني / جامعة الفرات الاوسط التقنية
الكلية التقنية- نجف

قسم السيارات
م/١

امتحان الفصل الاول للعام الدراسي 2015- 2016

Answer All Questions

Q1 :A: Give the correct representation in visual basic for the following equations: (15 degree)

1. $\cos(t) - \sin^2(3t)$.
2. $e^{4t}(1+\cos(8t))$.
3. $|z-x^8|+ 6$

Q1:B: Find the result for each of the followings: (15 degree)

1. Math.sqrt(81) + 2.
2. Math.truncate (456.467).
3. Math .round(267.37865 , 3)

****

Q2:A: Select the correct choice for the following statements: (10 degree)
1.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

2. The code statement, 7 > = 5, will have a resulting condition
   A: no   B: true   C: false   D : none

Q2:B: which of the following accepted as visual variable and which are not accepted   (5 degree)

1.case   2.name6   3. Privatt   4. x   5.Dom

****

Q3:For each of the following sub program find the output: (24 degree)

```
1)  private sub button1_click()
Dim dblA as Double
Dim dblB as Double
Dim dblC as Double
Dim dblOutcome as Double
dblA = 45
dblB = 30
dblC = 3 * dblA/dblB
dblOutcome = 2 * dblC + 15
lablel1.text= dblOutcome
End Sub
```

```
2) private sub button1_click()
Dim i, j, k, z As Integer
    z = 2
    For i = 1 To 2
    For j = 1 To 2
        For k = 1 To 2
            ListBox1.Items.Add(3 * i + z)
            z = z + 2
        Next k
    Next j
    Next i
    MsgBox(i)
    MsgBox(j)
    MsgBox(k)
End Sub
```

Q4: A :The flowchart below represent program to compare two number if they are equal (6 d
or one greater than another number, redraw the flowchart with filling the empty shape with the correct stat
below.
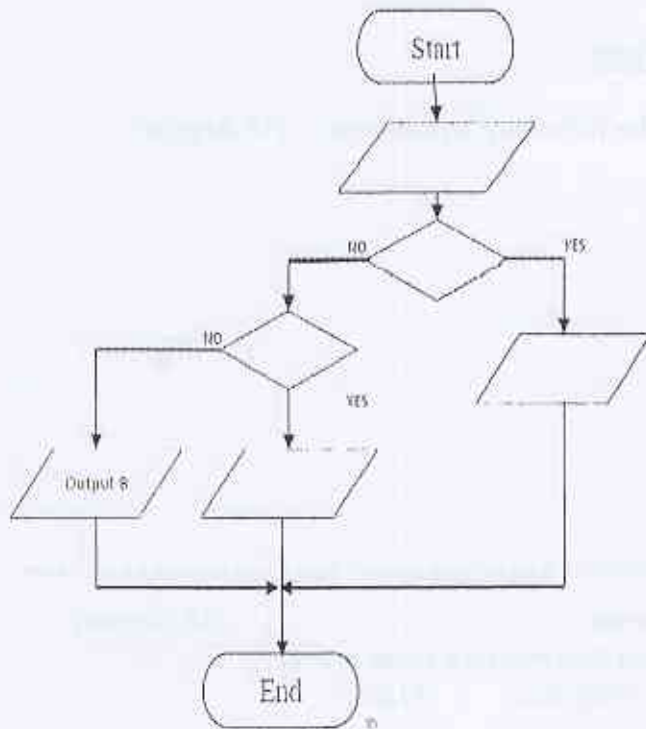
IS A=B

IS A > B

Output "equal"

Read A,B

Output A

Q4:B: Identify the syntax and logic ERROS in the following statements (10 degre
1. for i= -1 to 10
2. for j= 1 to - 4 step -3
3. for k= 10 to 1
4. for i = 2 to 6 step 2
5. for i= 5 step 3 to 10

****

Q5: write program that enter five numbers and find the average of even numbers (15 degre
and average of odd numbers and display the result in listbox

****

بالتوفـــيق

24/ 02/ 2016

رئيس القسم

مدرس المادة

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

1-The air-fuel mixture is actually burned during the ....
(A) exhaust stroke   (B) intake stroke   (C) power stroke   (D) compression stroke

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

3- .... oil rating-lowest quality oil, should not be used in automotive engines.
(A) SA   (C) SB
(B) SC   (D) SD

4-Which of the following is not related to a diesel engine?

(A)Spark ignition.   (C)No throttle valves for air control.
(B)Fuel quantity controls engine speed.   (D) All of the above are related to diesel engines.

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

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

7- A pressure relief valve can be located in the
(A)Oil pump   (B) engine block (C) oil filter housing   (D) Any of the above

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

9- 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

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

Q2\ Give the definition of the followings: *(Choose 5 only)*   **(20 Marks)**
Connecting rod,   Oil ring,   Gas Turbine,   Precombustion chamber,   Miller-cycle engine, Reverse flow cooling.

Q3\ Answer the following: **(20 Marks)**
1- List the flywheel functions?
2- List the functions of Thermostat?
3- List the functions of Lubrication system?
4- List common engine classifications?

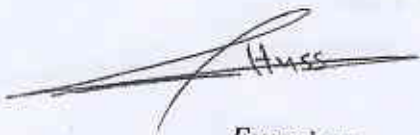Q4\ (A) List the components and explain the operation of lubrication system?   **(20 Marks)**
   (B) Explain the operation of Thermostat in cooling system?
   (C) List and explain the basic parts of a cooling system?

Q5\ Answer *two* of the followings: **(20 Marks)**
1- What are the differences between closed and open cooling systems?
2- What are the differences between Air and Liquid cooling systems?
3- What are the differences between spark ignition and compression ignition engines?

Good Luck

Examiner
A.Lec. Hussein Al-Abidi

Head of Department
Dr. Hyder Hassan

Q4. Answer _three_ branches only

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. 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)

C. Explain the actual valves timing diagram for four stroke cycle Spark Ignition engine with graph.

(10 marks)

D. 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 5.weight

(10 marks)

GOOD LUCK

مدرس المادة
م. م. بلاسم عبد الأمير القريشي

رئيس القسم
د. حيدر حسن العبدلي

2-2

قسم السيارات
ح / ب

المادة : Internal Combustion Engines
المرحلة : الثانية
وقت الامتحان : ساعتان
التاريخ: / 2 / 2016

وزارة التعليم العالي والبحث العلمي
جامعة الفرات الاوسط التقنية
الكلية التقنية الهندسية / النجف
قسم هندسة تقنيات السيارات

امتحان الفصل الاول للعام الدراسي 2015-2016

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

1. In a diesel engine temperature difference in combustion process equal to that in exhaust process, the thermal efficiency of this engine is ....
   _a._ 0.259 KJ   _b._ 0.259   _c._ 0.359 KJ   _d._ 0.359

2. The rotating shaft that used to push open valves at proper time in engine called ....
   _a._ cam shaft   _b._ crank shaft   _c._ push rod   _d._ connecting rod

3. The average piston speed for all engines in the range of ....
   _a._ 1 – 15 m/sec   _b._ 5 – 15 Km/hr   _c._ 5 – 15 Km/sec   _d._ 5 – 15 m/sec

4. An engine with crank angle ($\theta = 0$), crank shaft offset (a) and connecting rod length (r) The distance (s) between crank axis and wrist pin axis will be equal to ....
   _a._ $l + r$ _b._ $l - r$ _c._ $l + r^2$ _d._ $l - r^2$

5. The volumetric efficiency of an engine increase by increase ....
   _a._ air density   _b._ air mass flow rate   _c._ air temperature   _d._ fuel flow rate .

6. Indicator thermal efficiency of an actual 4-stroke SIE can be approximated equal to...... .
   _a._ $0.5 \, (\eta_t)_{otto}$ _b._ $0.85 \, (\eta_t)_{otto}$ _c._ $0.85 \, (\eta_t)_{Diesel}$ _d._ $(\eta_t)_{Diesel}$

(10 marks)

B. A 4-stoke SI engine work on air standard Otto cycle with compression ratio (9) at standard conditions for inlet air , if the conditions of inlet air changed by increase the temperature by 50% with constant compression ratio, what is the percent change in thermal efficiency of the engine .

(15 marks)

Q2. V6 SI square engine 4-stroke have the following data:

average piston speed	10m/sec
output torque	200 N.m
brake specific power	2250 Kw/m²

Determine the cylinder bore and crank shaft revelation per minute.

(25 marks)

Q3. 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. Prove that $(\eta_t)_{engine\,A} > (\eta_t)_{engine\,C} > (\eta_t)_{engine\,B}$

(20 marks)

Q4. Answer _three_ branches only

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. 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 $s = a\cos\theta + \sqrt[2]{r^2 - a^2 \sin^2\theta}$
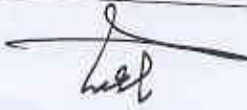
(10 marks)

C. Explain the actual valves timing diagram for four stroke cycle Spark Ignition engine with graph.

(10 marks)

D. 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 5.weight

(10 marks)

GOOD LUCK

مدرس المادة
م. م. بلاسم عبد الأمير القريشي

رئيس القسم
د. حيدر حسن العبدلي

2-2

قسم هندسة تقنيات السيارات

الرسم الميكانيكي/ المرحلة

الوقت/ ساعت

وزارة التعليم العالي والبحث العلمي   قسم السيارات
جامعة الفرات الاوسط التقنيـــــة   رس/ح/
الكلية التقنية الهندسيـــــة/ نجف

Q1/ For the assembly, draw the following:

A) Front View

B) Side View

DETAIL 1

R12

R6

60

12   30   48   60

100

12

10

3 holes tapped M 6

40

12

60

12

DETAIL 2

Ø 20

Ø 20

3   4   10   15   12

DETAIL 4

Ø 3

15

12

12

12

2

6

25

12

DETAIL 3
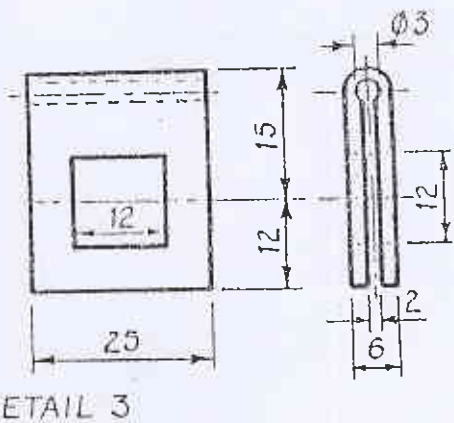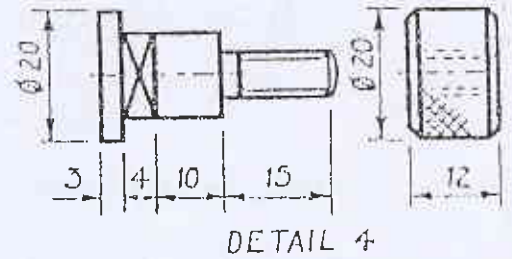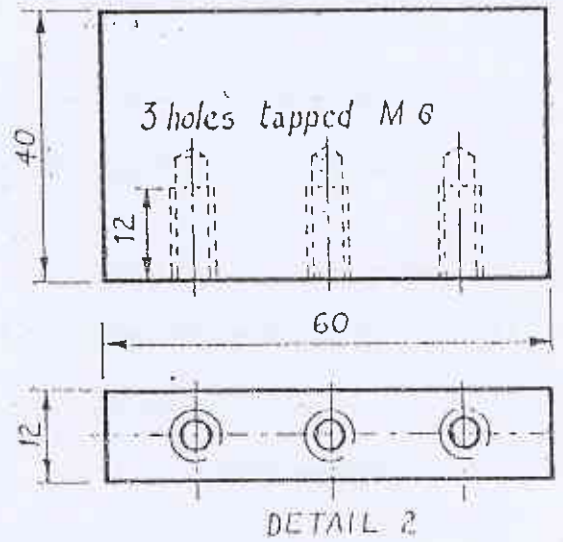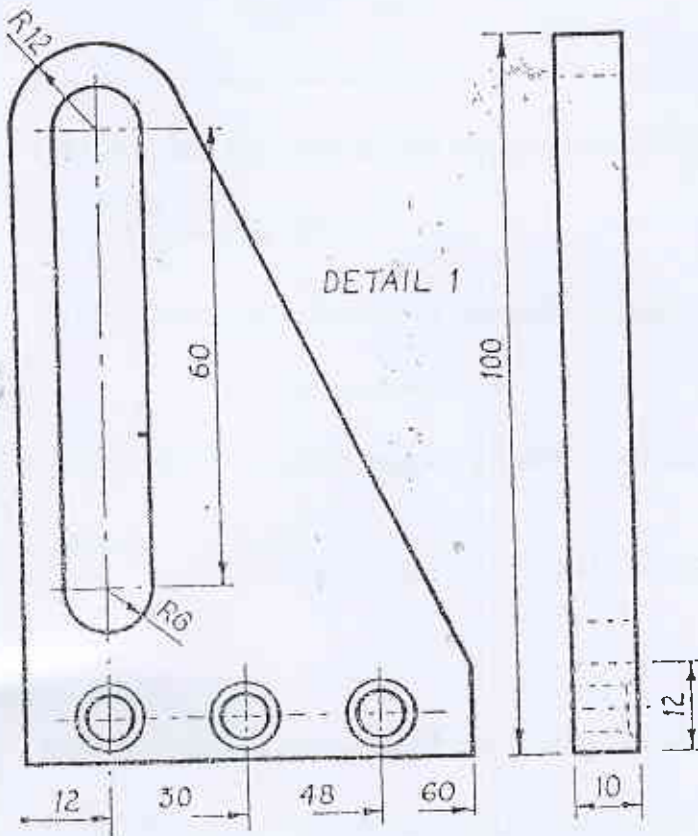
Technical College of Najaf

Automotive Department

Examiner: Oraskhudayer   *First Attempt (2015-2016)*   *Time :hrs*

Subject:Mathematics

Class: 2nd Stage

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Q1/(A) Find the area of the region that is bounded by $X= 9-Y^2$, $X= Y^2- 4$

and $\frac{X}{9} + \frac{Y}{2} = 1$? (20 D)

(B) Find the surface area of the parabolized $Z= X^2 + Y^2$ below the plane $Z=1$? (15 D)

···

Q2/ Show by transferring to **polar coordinates**   **(30 D)**

$$\int_0^{a \sin \beta} \int_0^{\sqrt{a^2-y^2}} Ln\ (x^2 + y^2)\ dxdy = a^2 \beta \left(Ln\ a - \frac{1}{2}\right),\ 0< \beta < \frac{\pi}{2}$$

···

Q3/(A) Find an equation of the plane containing the line $X=3t$, $Y=1+t$,$Z=t$ and

Parallel to the intersection of the plane $2X-Y+Z=0$ and $X+Y+1=0$?   **(18 D)**

(B) Find the volume common to the surfaces $X^2 + Y^2 = a\ X$ and $Z^2 = a\ X$? **(17 D)**

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Subject: Automobile Electricity   Ministry of Higher Education

Class: 2nd   and Scientific Research   Date: /2/2016

Time: 2 hours   Al-Furat Al-Awsat Technical University

Engineering Technical College / Najaf

Note : Answer all questions

Q1. Define five only:

1) NTC resistance   2) battery charge indicator   3) hydrometer   4) armature   5) contact rings (20 marks)

6) insulator

Q2. Choose the more correct answer:

1- The N type material has ……………….. free electron when compared with P material.

a) no   b) extra   c) less   d) same value

2- European standards generally use the figure of ……… C as the cold start limit of a battery.

a) 0°   b) -8 °   c) -18 °   d) -28 °

3- Many voltage regulators incorporate some temperature compensation to ……………

a) supply different charging rate at different condition   b) protect the battery from explosion

c) protect charging system from overheat   d) warm up battery at start up

4- Two types of voltage regulator are ……………

a) rotary and stationary   b) internal and external   c) mechanical and electronic

d) integrated and separated

5- In heavy vehicles a figure of 24v system used instead of 12v system to ………………

a) extend the life of battery   b) protect the electronic component from voltage drop

c) use smaller diameters of wires   d) give an extra power to operate accessories

Q3. Explain and draw the voltage regulation circuit in charging system (20 marks)

Q4. A/ Numerate the battery parts. (11 marks)

Q4. B/ Numerate the methods used to measure the battery capacity (9 marks)

Q5. A/ What are the types of materials? (electrical classification) (10 marks)

Q5. B/ Why the electrolyte strength changes during usage of battery? How it's measured? 10M

Teacher

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