جمهورية العراق

وزارة التعليم العالي و البحث العلمي

جامعة الفرات الأوسط التقنية

الكلية التقنية الهندسية / النجف

قسم هندسة تقنيات السيارات

المرحلة الثالثة

أسئلة الامتحان النهائي للعام الدراسي

٢٠١٥-٢٠١٦

الدور الأول

شعبة ضمان الجودة و الأداء الجامعي

قسم السيارات
م/ حس

ry of Higher Education & Scientific Research
Furat Al-Awsat Technical University
Najaf Technical Engineering College
Automobile Department

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

Final Examination (first attempt) for the academic year 2015-2016

Notes: 1-Answer five questions only. 2- Question 1 is required and answer it on the Exam. paper.

Q1/ choose the correct answer: (40 M)

1. The units of heat flux are:
• Watts • Joules • Joules / meters^2 • Watts / meters^2 • Joules / Kg.K

2. The units of thermal conductivity are:
• Watts / meters^2 K • Joules • Joules / meters^2 • Joules / second meter K
• Joules / Kg K

3. The heat transfer coefficient is defined by the relationship
• $h = m\ Cp\ \Delta T$ • $h = k / L$ • $h = q / \Delta T$ • $h = Nu\ k / L$ • $h = Q / \Delta T$

4. Which of these statements is not true?
• Conduction can occur in liquids • Conduction only occurs in solids
• Thermal radiation can travel through empty space • Convection cannot occur in solids • Gases do not absorb thermal radiation

5. What is the heat flow through a brick wall of area 10m^2, thickness 0.2m, k = 0.1 W/m K with a surface temperature on one side of 20°C and 10°C on the other?
• 50 Watts • 50 Joules • 50 Watts / m^2 • 200 Watts • 200 Watts / m^2

6. A pipe of surface area 2m^2 has a surface temperature of 100°C, the adjacent fluid is at 20°C, the heat transfer coefficient acting between the two is 20 W/m^{2}K. What is the heat flow by convection?
• 1600 W • 3200 W • 20 W • 40 W • zero

7. The value of the Stefan-Boltzmann constant is:
• 56.7 × 10-6 W/m^{2}K^4 • 56.7 × 10-9 W/m^{2}K^4 • 56.7 × 10-6 W/m^{2}K
• 56.7 × 10-9 W/m^{2}K • 56.7 × 10-6 W/m K

8. The different modes of heat transfer are:
• Forced convection, free convection and mixed convection
• Conduction, radiation and convection • Laminar and turbulent
• Evaporation, condensation and boiling • Cryogenic, ambient and high temperature

9. Mixed convection refers to:
• Combined convection and radiation • Combined convection and conduction
• Combined laminar and turbulent flow • Combined forced and free convection
• Combined forced convection and conduction

10. The thermal diffusivity, α , is defined as:
• = μ Cp / k • = k Cp / ρ • = k / ρ Cp • = h L / k • = L / k

11. Which of these statements is a correct expression of Fourier's Law

• $q = m C_p \Delta T$ • $q_x = -k\frac{dT}{dx}$ $q_x = -k\frac{\partial T}{\partial y}$ $Q_x = -k\frac{\partial T}{\partial x}$ $Q_x = -k\frac{\partial T}{\partial y}$

12. Which of the following is NOT a boundary condition?
• $T_{x=L} = 50°C$ • $q_{x=L} = q_{input}$ • $-k(dT/dx)_{x=L} = h(T_s - T_f)$
• $T_{y=L/2} = T_0(1 - x/L)$ • k = 16 W/m K

13. The statement $T_{x=0} = T_0$, means that:
• The temperature at x = 0 is zero • The temperature at x = 0 is constant
• The temperature at x = L is zero • The temperature at x = L is constant
• The surface at x = 0 is adiabatic
14. The statement $-k(dT/dx)_{x=L} = h(T_s - T_f)$ means that:
• The temperature at x = L is constant • the heat flux at x = L is constant
• Heat transfer by convection is zero at x = L
• Heat transfer by conduction is zero at x = L
• Heat transfer by convection equals that by conduction at x = L
15. A large value of heat transfer coefficient is equivalent to:
• A large thermal resistance • A small thermal resistance • Infinite thermal resistance • Zero thermal resistance • It depends on the fluid temperature
16. Calculate the heat flow through a 100 m length of stainless steel (k = 16 W/m K) pipe of 12mm outer diameter and 8 mm inner diameter when the surface temperature is 100°C on the inside and 99.9°C on the outside.
• 800 W • 670 W • 3 kW • 2.5 kW • 2 kW
17. Applied to a pipe, the critical insulation radius describes a condition when:
• The flow is turbulent • The heat flow is infinite • The heat flow is a maximum
• The heat flow is a minimum • The heat flow is zero
18. For 1-D conduction in a plane wall, the temperature distribution is:
• Parabolic • Logarithmic • Linear • Quadratic • Trigonometric
19. A good insulator has:
• A large value of k • A small value of k • An infinite value of k • A large value of h
• A large value of h and a small vale of k
20. Which of the following is NOT an example of a fin?
• Ribs on an electric motor casing • A concrete balcony protruding from a wall
• A turbine blade in a hot gas path • An insulated pipe carrying high pressure steam
• Porcupine spines
21. Which is NOT a boundary condition for a fin analysis ?
• $T \rightarrow T_f$ as $L \rightarrow \infty$ • $(dT/dx)_{x=L} = 0$ • $-k(dT/dx)_{x=0} = h_{tip}(T_{x=L} - T_f)$
• hP/kA_c = constant • Tx=L = constant
22. A heat transfer correlation is used to:
• Estimate Re • Estimate the fluid velocity • Estimate the fluid thermal properties
• Estimate the heat transfer coefficient • Estimate radiation effects
23. Which of these is NOT a fluid property
• Density • Thermal conductivity • Viscosity • Prandtl number • Reynolds number
24. Which statement is true of forced convection?
• Nu α Gr Pr • Nu α Re Pr • Nu α Pr (only) • Nu α M (Mach number)
• Nu α Re (only)
25. Which statement is true of free convection?
• h is always constant • h depends on external velocity
• h depends on temperature difference, ΔT
• h is independent of temperature difference, ΔT • The flow is always laminar

26. The definition of the Prandtl number is:
• $Pr = \rho Cp / \mu$ • $Pr = \mu Cp / \rho$ • $Pr = \rho Cp / k$ • $Pr = \mu Cp / k$ • $Pr = h L / k$
27. In forced convection over a flat plate, what is the appropriate length scale for local values of Nu and Re?
• The boundary layer thickness, δ
• The width (i.e. in the direction across the flow) of the plate
• the thickness of the plate
• The distance from the leading edge (i.e., in the direction of the flow), x
• The overall length of the plate, L
28. In forced convection over a flat plate, what is the appropriate length scale for the average Nusselt number?
• The boundary layer thickness, δ
• The width (i.e. in the direction across the flow) of the plate
• The thickness of the plate
• The distance from the leading edge (i.e., in the direction of the flow), x
• The overall length of the plate, L
29. The Prandtl number is a measure of
• Compressibility effects • Turbulence level • Forced / Free convection effects
• Viscosity • Relative thickness of velocity and thermal boundary layers
30. Which is NOT an example of a heat exchanger?
• Automotive radiator • Central heating radiator • Electric kettle
• Engine oil cooler • Cooling tower
31. A car radiator may be classified as what sort of heat exchanger?
• Shell and tube • Plate fin • Tube fin • Double pipe • Direct contact
32. For a heat exchanger passage with a value of heat transfer coefficient on each side, h, the overall heat transfer coefficient is:
• 2h • h^2 • $(h)^{1/2}$ • h/4 • h/2
33. To increase the overall heat transfer coefficient in an air to water heat exchanger one would:
• Increase the flow rate of the water • Increase the flow rate of the air and the water
• Increase the flow rate of the air • Increase the air pressure • None of these
34. The logarithmic mean temperature difference is defined as:
• $(\Delta T2 - \Delta T1) / \log_e (\Delta T1 / \Delta T2)$ • $\Delta T2 - \Delta T1$ • $\log_e (\Delta T1 / \Delta T2)$
• $(\Delta T1 - \Delta T2) / \log_e (\Delta T1 / \Delta T2)$ • $(T2 - T1) / \log_e (\Delta T1 / \Delta T2)$
35. A heat exchanger is used to cool 1 kg/s of oil (Cp = 2 kJ/kg.K) from 90°C to 70°C with a 0.5 kg/s flow of water (Cp = 4 kJ/kg.K). If the water has an inlet temperature of 10°C, what is the water exit temperature?
• 10°C • 20°C • 30°C • 40°C • 50°C

Q2/A/ Prove that the critical thickness of insulation for a circular pipe is: (5 M)

$$r_c = k_{ins} / h_{out}$$

Q2/B/ The Figure (1) shows a cross section through an insulated heating pipe which is made from steel (k = 45 W/m K) with an inner radius of 150 mm and an outer radius of 155 mm. The pipe is coated with 100 mm thickness of insulation having a thermal conductivity of k = 0.06 W/m K. Air at Ti = 60°C flows through the pipe and the convective heat transfer coefficient from the air to the inside of the pipe has a value of hi = 35 W/m^2 K. The outside surface of the pipe is surrounded by air which is at 15°C and the convective heat transfer coefficient on this surface has a value of h_o = 10 W/m^2 K. Calculate: (10 M)

1- The heat loss through 50 m of this pipe.
2- The critical insulation radius.
3- Increasing the insulation thickness will decreasing the heat losses or increasing it.

Q3/ The design of a single 'pin fin' which is to be used in an array of identical pin fins on an electronics heat sink is shown in Figure 2. The fin is made from cast aluminum, k = 180 W/m K, the diameter is 3 mm and the length 15 mm. There is a heat transfer coefficient of 30 W/m^2 K between the surface of the fin and surrounding air which is at 25°C. (15 M)

1. Use the expression for a fin with an adiabatic tip to calculate the heat flow through a single pin fin when the base has a temperature of 55°C.
2. Calculate also the efficiency and the effectiveness of this fin design.
3. How long would this fin have to be to be considered "infinite"?

Q4/ The heat transfer coefficient for air flowing over a sphere (ρ =8933 kg/m^3, c =389 *J/Kg.K and* k =398 *W/m.K*) is to be determined by observing the temperature–time history of a sphere fabricated from pure copper. The sphere, which is 12.7 mm in diameter, is at 66 °C before it is inserted into an airstream having a temperature of 27 °C. A thermocouple on the outer surface of the sphere indicates 55 °C at 69 s after the sphere is inserted into the airstream. Assume and then justify that the sphere behaves as a spacewise isothermal object and calculate the heat transfer coefficient. (15 M)

Q5/ Air at temperature 527 °C and 1 bar pressure flows with a velocity of 10 m/s over a flat plate 0.5m long. Estimate the cooling rate per unit width of the plate needed to maintain it at a surface temperature of 27 °C assuming the contribution of radiation contribution is negligible. (15 M)

Q6/ A concentric tube heat exchanger is used to cool lubricating oil for a large diesel engine. The inner tube is constructed of 2 mm wall thickness stainless steel, having k = 16 W/m K. The flow rate of cooling water through the inner tube (r_i = 30mm) is 0.3 kg/s. The flow rate of oil through the tube (r_o = 50mm) is 0.15 kg/s. Assume fully developed flow, if the oil cooler is to be used to cool oil from 90 °C to 50 °C using water available at 10 °C, calculate: (15 M)

a) The length of the tube required for parallel flow;

a) The length of the tube required for counterflow;
c) The area required for a single pass cross-flow heat exchanger with both streams umixed, operating at the same temperatures and flow rates and with the same value of U as in a and b above.

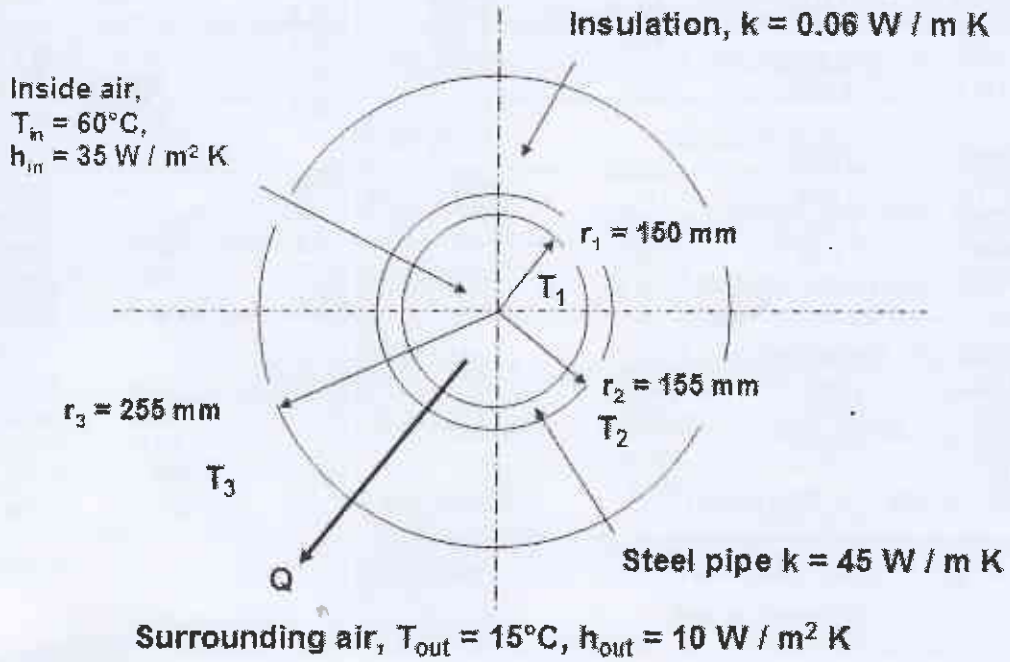


Figure 1

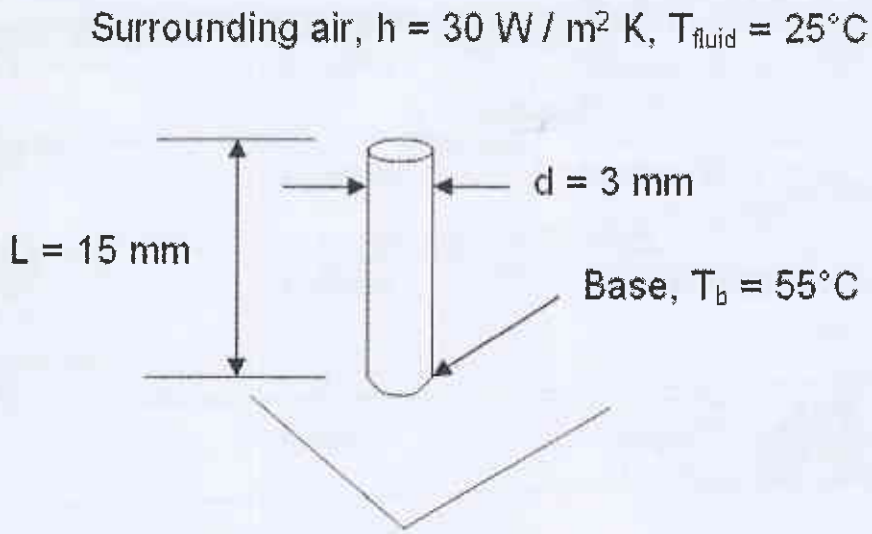


Figure 2

Head of Dep. Examiner

Good Luck

TABLE Thermophysical Properties of Gases at Atmospheric Pressure

T (K)	ρ (kg/m³)	c_p (kJ/kg · K)	$\mu \cdot 10^7$ (N · s/m²)	$\nu \cdot 10^6$ (m²/s)	$k \cdot 10^3$ (W/m · K)	$\alpha \cdot 10^6$ (m²/s)	Pr
Air. M = 28.97 kg/kmol							
100	3.5562	1.032	71.1	2.00	9.34	2.54	0.786
150	2.3364	1.012	103.4	4.426	13.8	5.84	0.758
200	1.7458	1.007	132.5	7.590	18.1	10.3	0.737
250	1.3947	1.006	159.6	11.44	22.3	15.9	0.720
300	1.1614	1.007	184.6	15.89	26.3	22.5	0.707
350	0.9950	1.009	208.2	20.92	30.0	29.9	0.700
400	0.8711	1.014	230.1	26.41	33.8	38.3	0.690
450	0.7740	1.021	250.7	32.39	37.3	47.2	0.686
500	0.6964	1.030	270.1	38.79	40.7	56.7	0.684
550	0.6329	1.040	288.4	45.57	43.9	66.7	0.683
600	0.5804	1.051	305.8	52.69	46.9	76.9	0.685
650	0.5356	1.063	322.5	60.21	49.7	87.3	0.690
700	0.4975	1.075	338.8	68.10	52.4	98.0	0.695
750	0.4643	1.087	354.6	76.37	54.9	109	0.702
800	0.4354	1.099	369.8	84.93	57.3	120	0.709

TABLE Temperature distribution and heat loss for fins of uniform cross section

Case	Tip Condition ($x = L$)	Temperature Distribution θ/θ_b	Fin Heat Transfer Rate q
A	Convection heat transfer: $h\theta(L) = -k\,d\theta/dx\|_{x=L}$	$\dfrac{\cosh m(L-x) + (h/mk)\sinh m(L-x)}{\cosh mL + (h/mk)\sinh mL}$	$M\dfrac{\sinh mL + (h/mk)\cosh mL}{\cosh mL + (h/mk)\sinh mL}$
B	Adiabatic: $d\theta/dx\|_{x=L} = 0$	$\dfrac{\cosh m(L-x)}{\cosh mL}$	$M \tanh mL$
C	Prescribed temperature: $\theta(L) = \theta_L$	$\dfrac{(\theta_L/\theta_b)\sinh mx + \sinh m(L-x)}{\sinh mL}$	$M\dfrac{(\cosh mL - \theta_L/\theta_b)}{\sinh mL}$
D	Infinite fin ($L \to \infty$): $\theta(L) = 0$	e^{-mx}	M

$\theta \equiv T - T_\infty$ $\quad m^2 \equiv hP/kA_c$

$\theta_b = \theta(0) = T_b - T_\infty$ $\quad M \equiv \sqrt{hPkA_c}\,\theta_b$

7 Summary of convection heat transfer correlations for external flow[a,b]

Relation	Geometry	Conditions[c]
$= 5x\,Re_x^{-1/2}$	Flat plate	Laminar, T_f
$_{,x} = 0.664\,Re_x^{1/2}$	Flat plate	Laminar, local, T_f
$u_x = 0.332\,Re_x^{1/2}\,Pr^{1/3}$	Flat plate	Laminar, local, T_f, $Pr \gtrsim 0.6$
$_t = \delta\,Pr^{-1/3}$	Flat plate	Laminar, T_f
$_{,L} = 1.328\,Re_L^{1/2}$	Flat plate	Laminar, average, T_f
$\overline{Nu}_L = 0.664\,Re_L^{1/2}\,Pr^{1/3}$	Flat plate	Laminar, average, T_f, $Pr \gtrsim 0.6$
$Nu_x = 0.564\,Pe_x^{1/2}$	Flat plate	Laminar, local, T_f, $Pr \lesssim 0.05$, $Pe_x \gtrsim 100$
$_{,x} = 0.0592\,Re_x^{4/5}$	Flat plate	Turbulent, local, T_f, $Re_x \lesssim 10^8$
$= 0.37x\,Re_x^{-1/5}$	Flat plate	Turbulent, T_f, $Re_x \lesssim 10^8$
$Nu_x = 0.0296\,Re_x^{4/5}\,Pr^{1/3}$	Flat plate	Turbulent, local, T_f, $Re_x \lesssim 10^8$, $0.6 \lesssim Pr \lesssim 60$
$_L = 0.074\,Re_L^{4/5} - 1742\,Re_L^{1}$	Flat plate	Mixed, average, T_f, $Re_{x,c} = 5 \times 10^5$, $Re_L \lesssim 10^8$
$\overline{Nu}_L = (0.037\,Re_L^{4/5} - 871)Pr^{1/3}$	Flat plate	Mixed, average, T_f, $Re_{x,c} = 5 \times 10^5$, $Re_L \lesssim 10^8$, $0.6 \lesssim Pr \lesssim 60$
$_D = C\,Re_D^{n}\,Pr^{1/3}$ able 2)	Cylinder	Average, T_f, $0.4 \lesssim Re_D \lesssim 4 \times 10^5$, $Pr \gtrsim 0.7$
$_D = C\,Re_D^{n}\,Pr^{n}(Pr/Pr_s)^{1/4}$ able 4)	Cylinder	Average, T_∞, $1 \lesssim Re_D \lesssim 10^6$, $0.7 \lesssim Pr \lesssim 500$
$_D = 0.3 + [0.62\,Re_D^{1/2}\,Pr^{1/3} \times [1 + (0.4/Pr)^{2/3}]^{1/4}] \times [1 + (Re_D/282{,}000)^{5/8}]^{4/5}$	Cylinder	Average, T_f, $Re_D\,Pr \gtrsim 0.2$
$_D = 2 + (0.4\,Re_D^{1/2} + 0.06\,Re_D^{2/3})Pr^{0.4} \times (\mu/\mu_s)^{1/4}$	Sphere	Average, T_∞, $3.5 \lesssim Re_D \lesssim 7.6 \times 10^4$, $0.71 \lesssim Pr \lesssim 380$, $1.0 \lesssim (\mu/\mu_s) \lesssim 3.2$

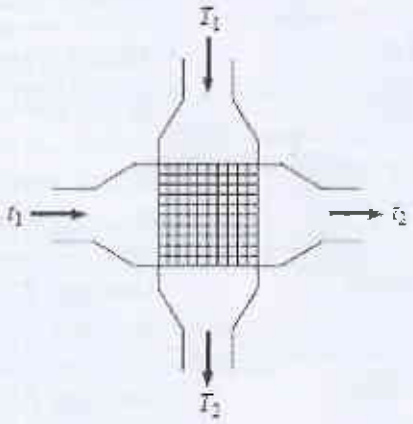
TABLE 7 *(Continued)*

Correlation		Geometry	Conditions[a]
$\overline{Nu}_D = 2 + 0.6\, Re_D^{1/2}\, Pr^{1/3}$		Falling drop, Sphere	Average, T_∞
$\overline{Nu}_D = C_1 \mathrm{Re}_D^{m}$ (Table 5)		Tube bank[d]	Average, $\overline{T}$. $2000 \le \mathrm{Re}_D \le 40000$, $\mathrm{Pr} \ge 0.7$, $NL \ge 10$
$\overline{Nu}_D = 1.13 C_1 \mathrm{Re}_D^{m} \mathrm{Pr}^{1/3}$ (Table 5)		Tube bank[d]	Average, $\overline{T}$. $2000 \le \mathrm{Re}_D \le 40000$, *For other fluids*, $\mathrm{Pr} \ge 0.7$, $NL \ge 10$
$\overline{Nu}_D = C \mathrm{Re}_{D,\max}^{n} \mathrm{Pr}^{0.36} \left(\frac{\mathrm{Pr}}{\mathrm{Pr}_s}\right)^{1/4}$ (Table 6)		Tube bank[d]	Average, $\overline{T}$. $1000 \le Re_D \le 2 \times 10^5$, $0.7 \le Pr \le 500$, $NL \ge 20$
$\overline{Nu}_D = C_1 C_2\, Re_{D,\max}^{n}\, Pr^{0.36} (Pr/Pr_s)^{1/4}$ (Tables 6, 8)	(28)	Tube bank[d]	Average, $\overline{T}$. $10 \le Re_D \le 2 \times 10^5$, $0.7 \le Pr \le 500$

Correlations in this table pertain to isothermal surfaces; for special cases involving an unheated starting length or a uniform surface heat flux, When the heat and mass transfer analogy is applicable, the corresponding mass transfer correlations may be obtained by replacing *Nu* and *Pr* by *Sh* and *Sc*, respectively.

The temperature listed under "Conditions" is the temperature at which properties should be evaluated.

For tube banks, properties are evaluated at the average fluid temperature, $\overline{T} = (T_i + T_o)/2$.



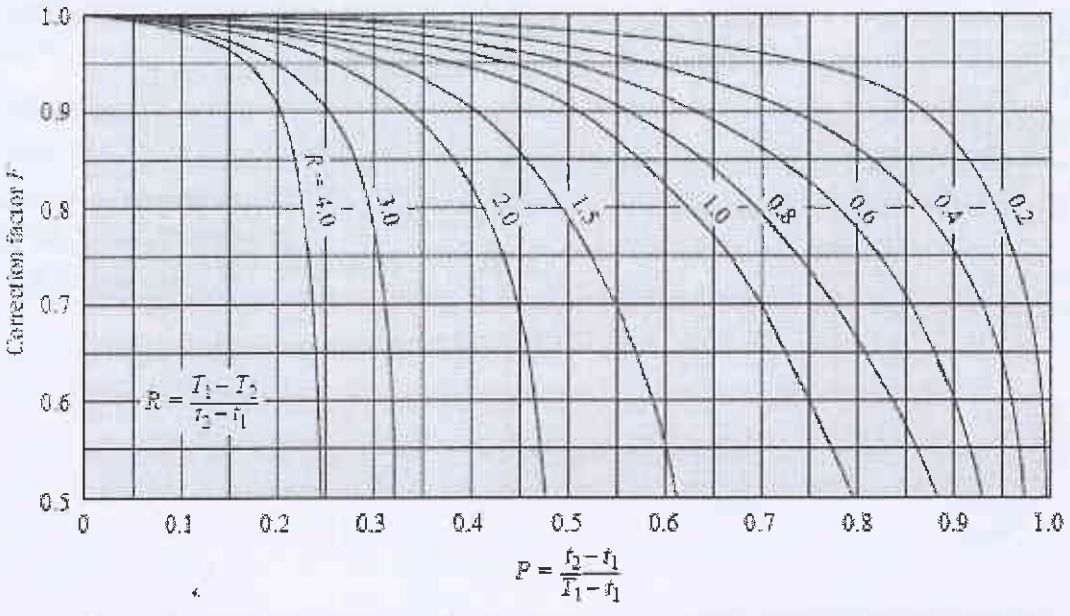


Figure Correction-factor plot for single-pass cross-flow exchanger, both fluids unmixed.

قسم السيارات

t: Automotive Technology — Ministry of Higher Education and Scientific Research — Date: /5/2016

Time: 3 hours — Al-Furat Al-Awsat Technical University

Class: 3rd — Engineering Technical College / Najaf

Final Exam 2015-2016

Note : Answer Five questions only

Q1. Define **five** only: (20 marks)

1- Impeller 2- Release fork 3- Bell housing 4- Hypoid differential gear set

5- Synchronizer 6- Torsion bar

Q2. Choose the correct answer: (20 marks)

1- The intermediate position between drive and coast, when neither the ring gear nor the pinion is driving each other, is called the …….. position.

a) opposite b) retard c) advanced d) floating

2- The …… used to dampen and absorb engine impulses and drive train vibration.

a) shock absorber b) spring c) clutch d) ball bearing

3- When the impeller is at maximum speed without rotation of the turbine the ……

a) engine rotate faster than the vehicle b) vehicle move fast

c) multi disc clutch will slippage d) greatest torque multiplication occurs

4- The …… used to convert energy of vehicle weight movement up and down into heat.

a) damper b) spring c) transmission d) clutch

5- The …… is a channel for excess lubricant oil to go out, from between the two pieces in MT.

a) oil seal b) synchronizer grooves c) bearing d) idler shaft

Q3.A/ What are the main parts of the suspension system? (10 M)

Q3.B/ What are the main parts of the clutch? (10 M)

Q4.A/ Explain the shifting procedure to reverse gear in manual transmission (10 M)

Q4. B / Explain the operation of differential. (10 M)

Q5. What are the functions of each one (choose **four** only) (20 marks)

1- C.V Joints 2- pilot bearing 3- counter shaft 4- stator 5- master leaf spring

Q6.A/ The drive shaft needs at least two pieces of U. joint . Why? (10 M)

Q6.B/ Explain the operation of torque converter (10 M)

Examiner

Ahmed Dheyaa Rabee

Head of Department

Dr. Haider Hasan

قسم السيارات
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Foundation of Technical Education
Technical Collage – Najaf
Automotive Eng. Department
Final Examination

Subject: measurement and control
Class: 3rd Year

Time: 3 Hour
Date: / / 2016
( ) Trial

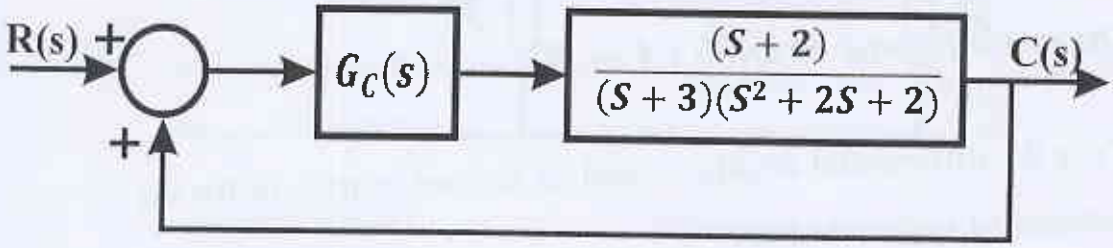
Notes/// 1. Answer all questions 2 Each question has (20M) only.

***Q.1*\ A control system has a transfer function of:**

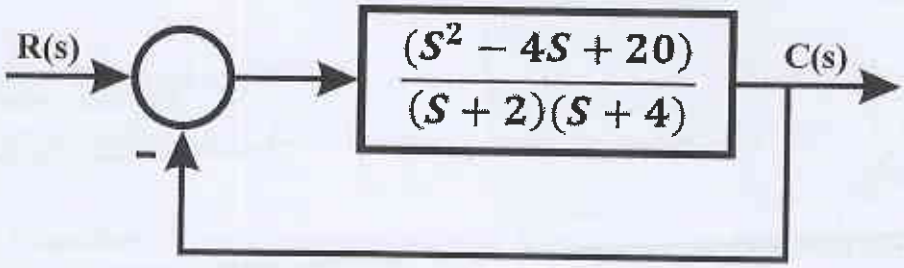
$$G(s) = \frac{8\,(S+3)(S+8)}{(S+2)(S+4)}$$

What will be the output as a time function and the steady state error, when it is subject to a unit step input?

***Q.2*\ Design the PI - Controller to control the system described in the block diagram below:**



***Q.3*\ Sketch the root locus for the system and discuss the stability.**



Foundation of Technical Education
Technical Collage – Najaf
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Final Examination

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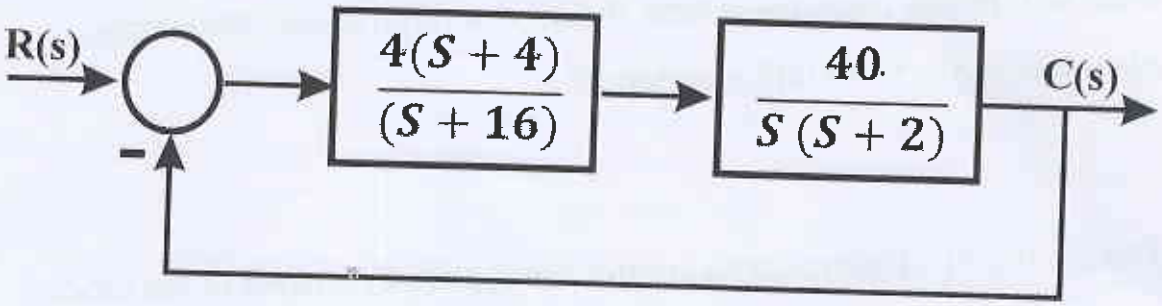
( ) Trial

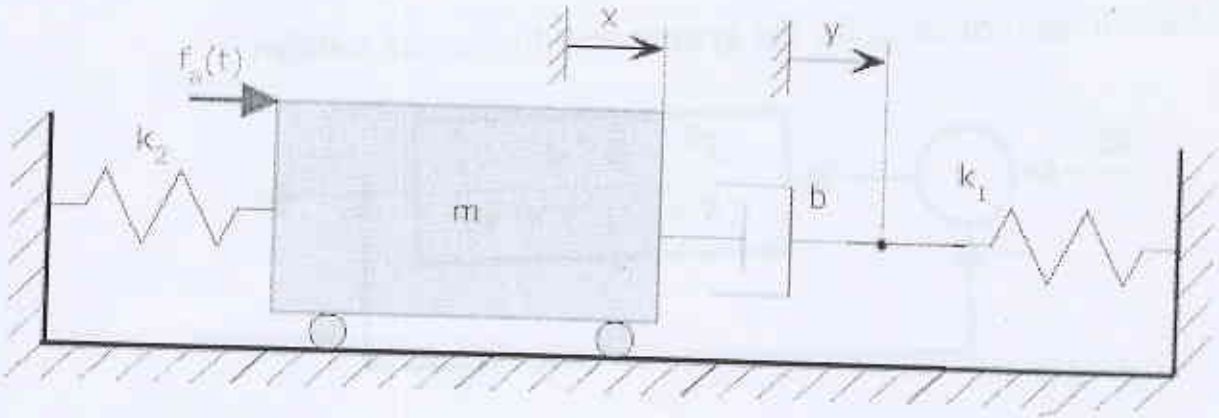
Notes/// 1. Answer all questions 2 Each question has (20M) only.

Q.4| Find the state and output equations for the closed loop system shown in figure.



Q.5| *Answer only one branch (A or B)*

A) Write the differential equations and its laplace transform for the mechanical system below.



Foundation of Technical Education
Technical Collage – Najaf
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Class: 3rd Year

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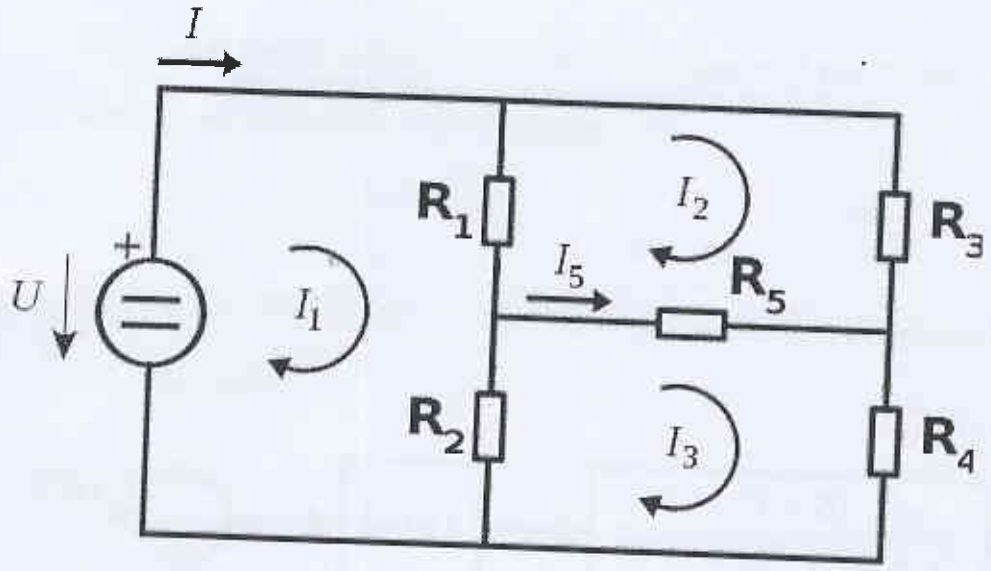
Notes/// 1. Answer all questions 2 Each question has (20M) only.

B) Develop the differential equations and its laplace transform for the electirical circuit below.



Mohammed N. N.
Jan . 10 . 2016

Examiner
Mohammed N. Altemimi

Department Header
Dr. Haider Hassan

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

Subject: THEORY OF MACHINES
Class: 3rd year.
Time: 3 hours
Date: / / 2016.

Note// Answer four questions only.

Q1

A mechanism, as shown in Fig. (1), has the following dimensions:
A = 200 mm; AB = 1.5 m; BC = 600 mm; CD = 500 mm and BE = 400 mm.
If crank OA rotates uniformly at 120 r.p.m clockwise, find:

1. The velocity of B, C and D,
2. The angular velocity of the links AB, BC and CD. (25 Marks)

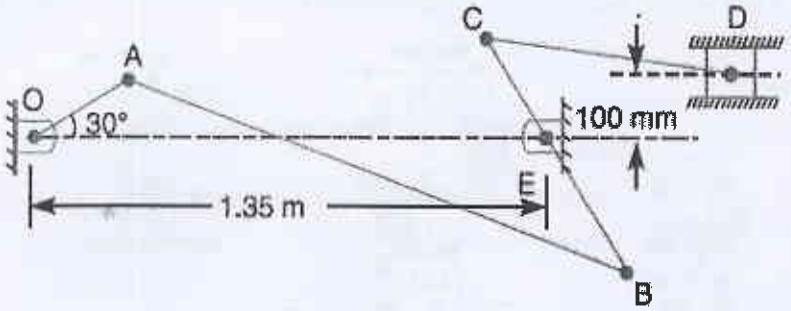

Fig.(1)

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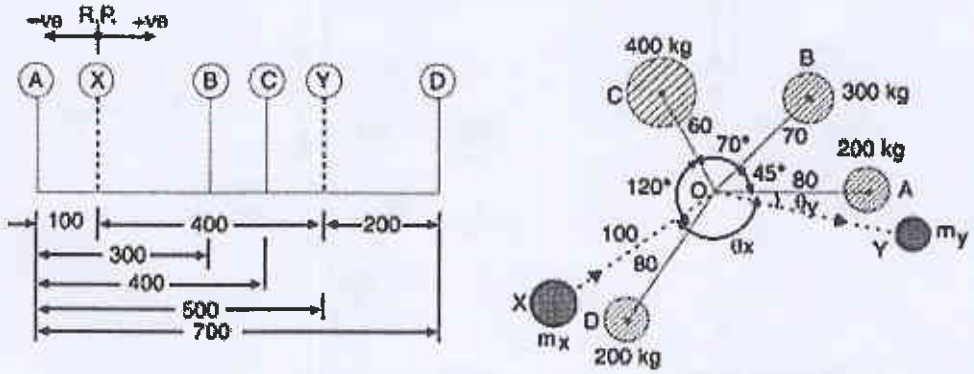
Q2

A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg,400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.



All dimensions in mm.

(25 Marks)

Fig.(2)

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

Subject: THEORY OF MACHINES
Time: 3 hours

Class: 1st year.
Date: / / 2016.

Note// Answer four questions only.

Q3

An engine, running at 150 r.p.m., drives a line shaft by means of a belt. The engine pulley is 750 mm diameter and the pulley on the line shaft being 450 mm. A 900 mm diameter pulley on the line shaft drives a 150 mm diameter pulley keyed to a dynamo shaft. Find the speed of the dynamo shaft, when;

1. there is no slip
2. there is a slip of 2% at each drive.

(25 Marks)

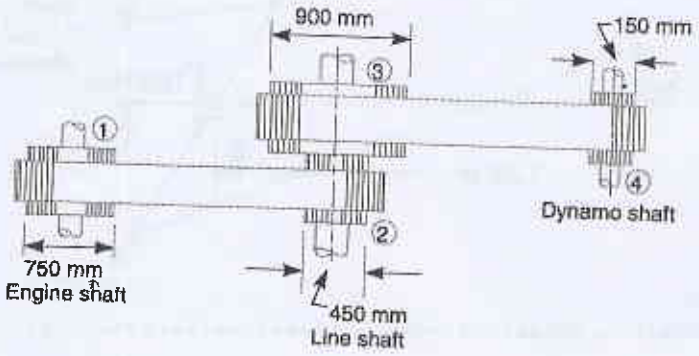
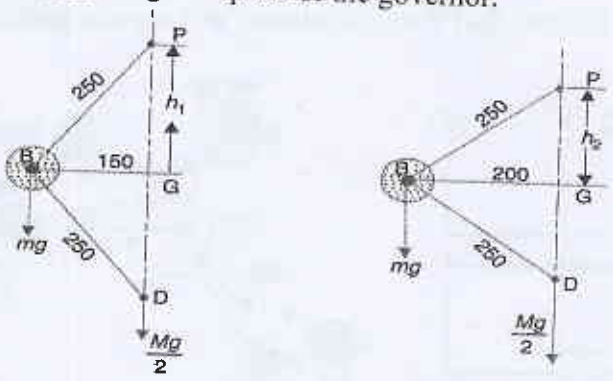


Fig.(3)

****

Q4

A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.



(a) Minimum position. (b) Maximum position.

(25 Marks)

Fig.(4)

Ministry of Higher Education and Scientific Research
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Class: 1st year.
Date: / / 2016.

Note// Answer four questions only.

Q5

Determine the width of a 9.75 mm thick leather belt required to transmit 15 kW from a motor running at 900 r.p.m. The diameter of the driving pulley of the motor is 300 mm. The driven pulley runs at 300 r.p.m. and the distance between the centre of two pulleys is 3 meters. The density of the leather is 1000 kg/m3. The maximum allowable stress in the leather is 2.5 MPa. The coefficient of friction between the leather and pulley is 0.3. Assume open belt drive and neglect the sag and slip of the belt.

(25 Marks)

قسم السيارات ٣/١٠

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Tech. Eng. Collage – Najaf/ Automobile Tech. Eng. Dept.
Final examination/ 1st try (2015-2016)

Subject: Automotive Electronics and Computer Control
Time: 3 hours

Class: 3rd year
Date: / 6 / 2016

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

Q1. Which one of these (a, b, c, d) is the correct answer? Please read carefully? **(10%)**

1. Item Protects a circuit against damage caused by a short circuit is called

   a) Resistors b) Relay c) Fuse d) Diode

2. Which of the following is correct?
   a) Analog signals are either high-low, on-off, or yes-no.
   b) Digital signals are infinitely variable within a defined range.
   c) All of the above.
   d) None of the above.

3. Inductive sensors usually produce a:
   a) square wave
   b) saw tooth wave
   c) sine wave
   d) triangle

4. *Two technicians are diagnosing engine starts then stops. Technician A says that this means that the TPS is supplying incorrect information to the PCM. Technician B says that this indicates that the CMP sensor is defective. Which technician is correct?*

   a) A only. b) B only. c) Both A and B . d) Neither A nor B.

5. Technician A says during the processing function the computer uses input information and compares it to programmed instructions. Technician B says during the output function the computer will put out control commands to various output devices. Who is correct?

   a) A only. b) B only. c) Both A and B . d) Neither A nor B.

6. *Two technicians are diagnosing hesitation when accelerating. Technician A says that this means that the knock sensor is supplying improper information to the PCM. Technician B says that this indicates that vacuum hoses for leak. Which technician is correct?*

   a) A only. b) B only. c) Both A and B . d) Neither A nor B.

7. Technician A says EPROM memory is responsible for storing odometer . Technician B says it is responsible for storing mileage reading for an electronic dash display. Who is correct?

   a) A only. b) B only. c) Both A and B . d) Neither A nor B.

8. The main ECU 'input' parameters for calculating ignition timing and injector duration are:
   a) speed and temperature
   b) speed and load
   c) pressure and temperature
   d) pressure and load

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

9. Logic gates are being discussed. Technician A says NOT gate operation is similar to that of two switches in series to a load. Technician B says an AND gate simply reverses binary (1) to (0) and vice versa. Who is correct?

a) A only. b) B only. c) Both A and B. d) Neither A nor B.

10. Technician A says the knock sensor is located in the engine block. Technician B says is located in the cylinder head. Who is correct?

a) A only. b) B only. c) Both A and B. d) Neither A nor B.

****

Q2. Answer only five branches: **(25%)**

1. Describe the basics of NOT, AND, and OR logic gate operation.
2. Explain the differences between analog and digital signals.
3. Describe how the Stepper Motor IAC Valve operates.
4. Describe how electronic control of gasoline fuel injection timing.
5. Draw a block diagram of basic classifications of input sensors feed signals to ECU.
6. List and explain its location of the types of pressure sensors.

****

Q3.

A Explain the application and function of the following terms: **(answer only five)** **(10%)**

1. Transaxle/Transmission sensor.
2. Brake switch.
3. Impact sensor.
4. Engine control module.
5. ABS.
6. Air bag module.

B Specify the location and problem of the following faults: **(answer only five)** **(10%)**

Open MAF sensor,, shorted CMP sensor,, A faulty IAT sensor,, open TP sensor,, Defective oxygen sensor,, shorted wheel speed sensor .

****

Ministry of Higher Education and Scientific Research
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Tech. Eng. Collage – Najaf/ Automobile Tech. Eng. Dept.
Final examination/ 1st try (2015-2016)

Subject: Automotive Electronics and Computer Control
Time: 3 hours

Class: 3rd year
Date: / 6 / 2016

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

Q4. A *Please read the following problems carefully. How can you to diagnosis and repair problem?* ***(Answer only three problems)*** **(15%)**

1. **Problem:** Mr. Assed brings his 2013 (Ford with multiport EFI) to the shop, saying there is engine difficult to start when cold. The ignition system is in good condition.
2. **Problem:** Mr. Ahmed brings his (2014 Ford) into the shop .He explains that the car start engine and then stops. The ignition and air induction systems are in good condition.
3. **Problem:** Mr. Raid brings in his 2015 (Kia) into the shop, saying there is the Irregular idling speed.
4. **Problem:** Mr. Ali brings in his 2014 (Nissan) into the shop, saying there excessive fuel consumption.

Q4. B Describe the types of the oxygen sensor. How can you make oxygen sensor diagnostics? **(10%)**

****

Q5. Answer only four questions: **(20%)**

A// Explain the types of vehicle speed sensor .

B// Draw IAC system block diagram.

C// Describe the closed loop of electronic fuel injection system.

D// Explain the diagnostic trouble codes (DTCs) associated with the throttle position sensor.

E// What is the powertrain control system.

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

Head of dept.

Examiner

قسم السيارات
م ٣/

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Tech. Eng. Collage – Najaf/ Automobile Tech. Eng. Dept.
Final examination/ 1st try (2015-2016)

Subject: Automotive Electronics and Computer Control **Class: 3rd year**
Time: 3 hours **Date: / 6 / 2016**

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Q1. Which one of these (a, b, c, d) is the correct answer? Please read carefully? **(10%)**

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   b) speed and load
   c) pressure and temperature
   d) pressure and load

قسم السيارات
٣/٥

المرحلة: الثالثة		وزارة التعليم العالي و البحث العلمي
المادة: التطبيقات		جامعة الفرات للعلوم التقنية
الزمن: ثلاث ساعات		الكلية التقنية النجف
الممتحن: م. وسام احمد عبد الواحد		قسم الهندسة التقنية السيارات

Attempt 5 ~~Attempt all~~ questions only

All questions have equal marks

Q1: A: Solve the following differential equations by using Laplace transformation:

1- $y'' - y' - 2y = 0, \quad y(0) = 1, y'(0) = 0.$

2- $y'' + y = \sin t, \quad y(0) = 2, y'(0) = 1.$

B:

Find the inverse Laplace transforms of the following functions:

(a) $\frac{2s+2}{(s+2)(s-1)}$ (b) $\frac{s^2+1}{(s^2+2s+2)(s+1)}$

Q2: Find the Fourier expansion of the following formula:

$$f(t) = \begin{cases} t-1, & t \in [0,2); \\ 3-t, & t \in [2,4). \end{cases}$$

Q3: Solve the following partial differential equation by separation of variables:

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$

$u(x,0) = 1 \qquad \frac{\partial u}{\partial t}(x,0) = 0$

$u(0,t) = 0 \qquad u(L,t) = 0$

Q4:

Use Newton's Method to find the only real root of the equation $x^3 - x - 1 = 0$ correct to 9 decimal places.

Hint: start from x=1.5.

Q5: Compute the trapezoidal approximation, and one of Simpsons rule for $\int_0^2 \sqrt{x}dx$ using a regular partition with n=4. Compare the results with the exact value.

Q6: Find the value of y(2) for the following differential equation:

$$\frac{dy}{dx} + 2y = 1.3e^{-x}, y(0) = 5$$

the step used should be (0.5). Use Euler method.

GOOD LUCK

قسم السيارات
٣/س

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

القسم : هندسة تقنيات السيارات
المرحلة: الثالثة
المادة : حاسبة (Auto CAD)
الوقت : ثلاثة ساعات
التاريخ : 2016/ 6 / 7

الامتحان النهائي للعام الدراسي 2015 - 2016

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

Q1. Write ***True*** word in front of correct sentence and ***False*** word in front of incorrect sentence with correcting the error of the following: :

(20 marks)

1. Auto CAD program one of the programs that help in design and engineering drawing.
2. Limit command use to set up drawing color.
3. CAD refers to car added design.
4. Printing any drawing object by command plot.
5. To draw circle in Auto CAD program at command line by write *cir* .
6. To change the drawing background go to file.
7. To draw part of a circle in Auto CAD program at command line by write *c* .
8. To change the drawing units go to format.
9. To change the drawing size go to scale.
10. To draw dome in Auto CAD at command line by write *3d than write d* .

Q2. Define (WCS) and (UCS), what is the difference between them and what are the transformation methods from (WCS) to (UCS). ***(20 marks)***

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

(20 marks)

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

Q4. List in the coordinates entry methods in Auto CAD program with explain. ***(20 marks)***

Q5. How can you done the folloing jops in Auto CAD program:- ***(20 marks)***

1. Draw a polygon with *8* sides (the side length is *10mm*)
2. Moving the polygon in section (1) for a distance *20 mm* to right side.
3. Draw a circle with *25 mm* in radius than transform this circle to cylinder with *100mm* in height.
4. Draw a box with side length of (100 mm)

Q6. What is the name of the following bar, how it is appear on Auto CAD screen and what is name and function of each window of its windows.

(20 marks)

"ALL THE BEST"

مدرس المادة
م. م. بلاسم عبد الأمير القريشي

رئيس القسم
د. حيدر حسن العبدلي

قسم السيارات

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

قسم هندسة تقنيات السيارات
المادة: التصميم الميكانيكي ١
زمن الامتحان :ثلاث ساعات

Q1/ 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?

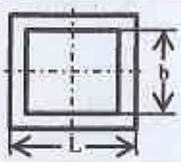
B) what angle of twist will create at shearing stress of 70 Mpa on the inner surface of the hollow steel shaft? (Note/ angle of twist must be in degrees).

Q2/ A piston of 20 mm inside diameter, as shown in figure(2) have 150 Kpa compression pressure and 121Kpa extension pressure using to test the rod's stiffness of 380Mpa ultimate point and 1.38 factor of safety and the endurance strength equal to 0.4 ultimate strength. If you know that the rod have square section area, design to calculate the side length (L) when the size effect is 0.8, surface finish factor 0.93 and the stress concentration factor is 1.22 for the fatigue load.

Q3/ The load (P) is applied on the bars as shown in the Fig.(3). Find the safe load (P) if the stress in Copper and steel are not to exceed 60N/mm^2 and 120 N/mm^2 respectively. E for steel = 200 KN/mm^2 and for Copper =100KN/mm^2. The Copper rods are 40mmX40 mm in section and steel one is 50mmX50mmin section.

Q4/ A rectangular cross-section bar is welded to a support by means of the fillet welds as shown in Fig.(4). Determine the size of the weld, if the permissible shear in the weld is limited to 75Mpa.

Hint: use the table blow.

Type of weld	Polar moment of inertia	Section modulus
	$\frac{t(b+L)\text{^}3}{6}$	$t(\frac{b\text{^}2}{3}+bL)$

Q5/ Design a steel spherical shell with 0.3817m^3 capacity and the maximum internal pressure is (1.663 Mpa). The increasing in volume under maximum pressure is 0.039% of original volume and the permissible tensile stress of the material is (85N/mm^2). Take poison's ratio as 0.3 and E=200KN/mm^2 for shell material.

WITH BEST WISHES

Lecturer
Dr. Ahmed H. Ali

Head of dep.
Dr. Haider H. Abd

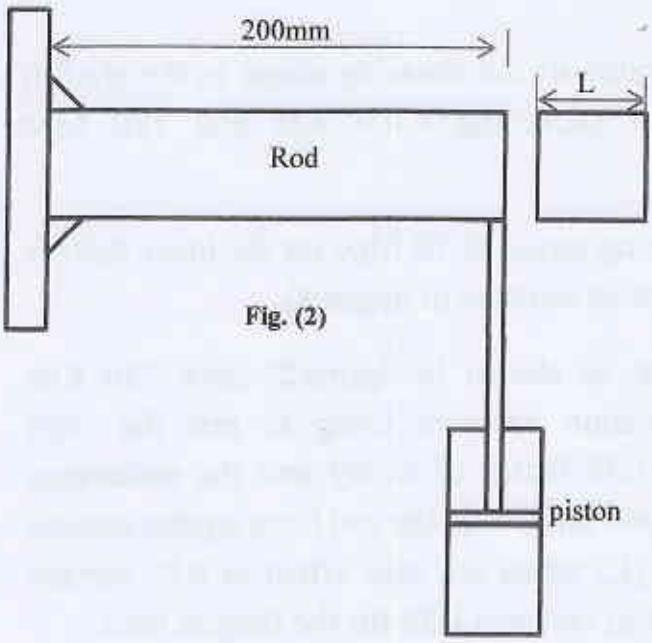


Fig. (2)

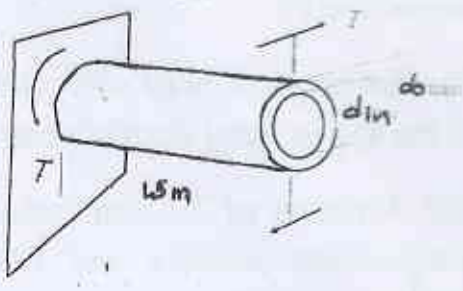


Fig. (1)

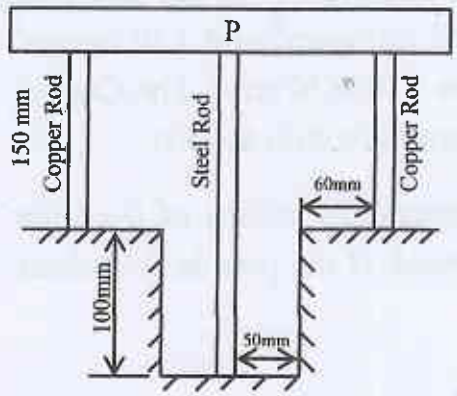


Fig. (3)

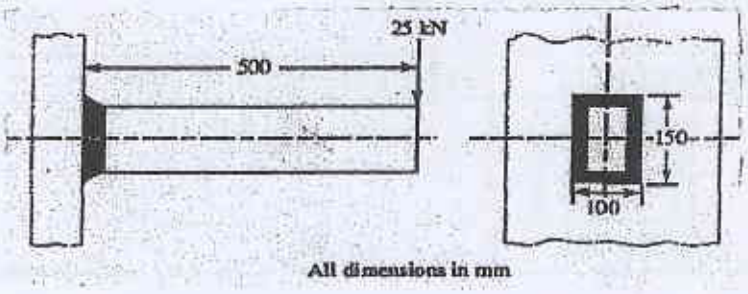


Fig. (4)