MAE IV Sem.

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH.], MAY – 2011

Paper Code : ETME 202	*Subject : KOM/DOM*
Paper Id : 36202	

Time : 3 Hours *Maximum Marks : 75*

Note : Q.No. 1 is compulsory. Attempt One question from each unit.

Q. 1. (a) Determine components and acceleration using vector algebra. **(5)**

(b) Using Grübleis equation draw the possible kinematic chairs with revolute pairs and single degree of peedism. **(5)**

(c) Explain the profile of Cam for inter valve of an IC engine. **(5)**

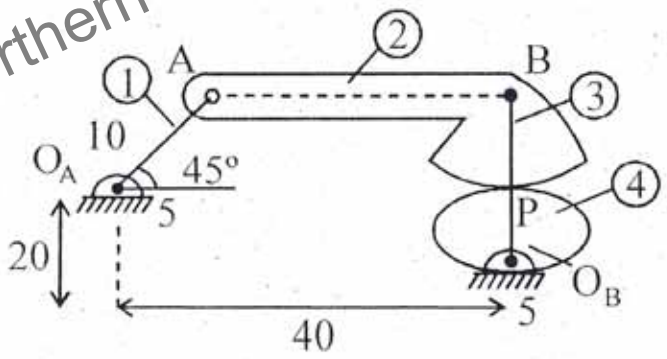
(d) What is logarithmic decrement. **(5)**

(e) Apply Newton is third law of motion to the rotary motion of ceiling fan with long rad. **(5)**

UNIT-I

Q. 2. Write Pseudo code for the computer program for output angle for the given input angle for bar mechanism. **(12.5)**

Q. 3.



AB= 30

$O_A B = 60$

Determine angular acceleration of link 4. **(12.5)**

UNIT-II

Q. 4. Design cam profile Rise-fall-dwell 60°-60°-240° Lift = 20mm, base circle 40mm, rise with constant acen and retardation and fall is SHm. **(12.5)**

Q. 5. Derive the expression for forced damped vibrations. **(12.5)**

UNIT-III

Q. 6. Explain how the conjugate of epicycloid is hypocycloid. **(12.5)**

Q. 7. Plot the fluction in energy for 4 stroke single cylinder SI engine. Assume L/R ration 2.8. **(12.5)**

Q. 8. Explain balancing of six cylinder inline engines. **(12.5)**

Q. 9. What is the gyroscopic effect on two wheeler negotiating a curve of radius R? **(12.5)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH.]– MAY 2011

Paper Code: ETME204 **Subject: Heat Transfer**

Time : 3 Hours **Maximum Marks : 75**

Note: Attempt five questions including Q.no.1 which is compulsory. Attempt one question from each unit. Use of steam table is permitted.

Q1 Answer briefly:- **(2.5x10=25)**

(a) Write the Fourier rate equation for heat transfer by conduction. Give the units and physical significance of each term in the equation.
(b) What are the various types of fins?
(c) Differentiate between mechanisms of heat transfer by free and forced convection.
(d) Distinguish between mechanism of filmwise condensation and dropwise condensation. Which type has the highest heat transfer coefficient?
(e) Explain the meaning of the terms effectiveness and NTU as applied to heat exchangers.
(f) What do you understand by a 'black body' and a 'gray body' as applied to radiation problems?
(g) What is the working principle of a centrifugal compressor?
(h) What is the difference between jet propulsion and rocket propulsion?
(i) What is the effect of friction on the flow through a steam nozzle?
(j) Explain the difference between an impulse turbine and a reaction turbine.

UNIT-I

Q2 (a) Derive an expression for heat flow through a composite cylinder taking into account the film heat transfer coefficients on the inside and outside surface of the cylinder. **(6)**

(b) Derive the governing differential equation for temperature distribution of constant area fin in the following form:-

$\frac{d^2\theta}{dx^2} - m^2\theta = 0$ Where θ=temperature excess above ambient air of the fin temperature at distance x from the root. $m = \sqrt{\frac{Ph}{KAc}}$, P=Perimeter of the fin, h=heat transfer coefficient, K=thermal conductivity of the fin material, Ac=area of cross-section of the fin. **(6.5)**

Q3 (a) Differentiate between Hydrodynamic and Thermal boundary layers. **(3)**

(b) The expression h l/k gives the Biot number as well as the Nusselt number. What is the difference between the two? **(3)**

(c) Show by dimensional analysis that data for forced convection may be correlation by an equation of the form: $Nu = \phi(R_e, P_r)$ where Nusselt number $Nu = (hl/k)$, Reynolds no. $\mathrm{Re} = (\delta V l/\mu)$ and Prandtl number $\mathrm{Pr} = (\mu Cp/K)$. **(6.5)**

UNIT-II

Q4 (a) Draw the boiling curve for water and explain various regimes in boiling. **(6)**

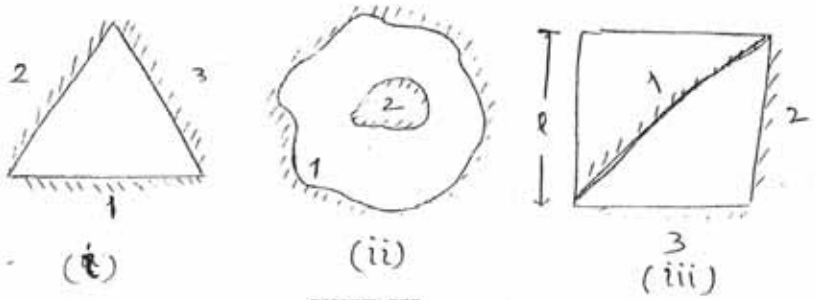
(b) Derive the following expression for the effectiveness of a parallel flow heat exchanger: $\epsilon = \frac{1-\exp[-NTU(1+C)]}{1+C}$ where C=capacity ratio=$\frac{C_{min}}{C_{max}}$. **(6.5)**

Q5 (a) State and explain the following laws related to thermal radiations:- **(2x3=6)**
(i) Planck's law (ii) Stefan Boltzman law (iii) Wien's displacement law

P.T.O.

(b) Calculate the shape factors for the configurations shown in the figures given below:- **(6.5)**

(i) Long tube with cross-section of an equilateral triangle.
(ii) Black body inside a black enclosure.
(iii) Diagonal partition within a long-square duct.



UNIT-III

Q6 (a) What are the advantages of multistage compression with intercooling? **(5)**

(b) Draw the indicator diagram for a two stage reciprocating air compressor with perfect intercooling and prove that work done per kg of air delivered is given by $w = \frac{2n}{n-1} RT1\left[\left(\frac{p_d}{p_s}\right)^{\frac{n-1}{2n}} - 1\right]$. **(7.5)**

Q7 (a) With the help of neat sketches explain the working of Turbojet and Turbo-prop engines. **(6)**

(b) A gas turbine plant consists of two turbines. One turbine to drive compressor and other turbine to develop power output and both are having their own combustion chambers which are served by air directly from the compressor. Air enters the compressor at 1 bar and 288K and is compressed to 8 bar with an isentropic efficiency of 76%. Due to heat added in the combustion chamber, the inlet temperature of gas to both turbines is 900°C. The isentropic efficiency of each turbine is 86% and the mass flow rate of air at the compressor is 23kg/s. The calorific value of fuel is 4200kJ/kg. Calculate the output of the plant and the thermal efficiency if mechanical efficiency is 95% and generator efficiency is 96%. Take C_p=1.005kJ/kgk and γ=1.4 for air and C_{pg}=1.128kJ/kgK and γ=1.34 for gases. **(6.5)**

UNIT-IV

Q8 (a) Derive the following expression for the critical pressure ratio of a steam nozzle $\frac{p_2}{p_1} = \left(\frac{2}{n+1}\right)^{\frac{n}{n+1}}$. Where n=isentropic index of expansion. **(6)**

(b) With the help of a neat sketch, explain the performance of a convergent-divergent nozzle operating at off-design conditions. **(6.5)**

Q9 (a) Draw the velocity diagram of a single stage impulse turbine and derive the expression for blade or diagram efficiency. Prove that the blade efficiency is maximum when $\rho = \frac{Cos\alpha}{2}$, where ρ=blade speed ratio, α=nozzle angle. **(6.5)**

(b) The velocity of steam exiting the nozzle of he impulse stage of a turbine is 400m/s. The blades operate close to the maximum blading efficiency. The nozzle angle is 20°. Considering equiangular blades and neglecting blade friction. Calculate for a steam flow of 0.6kg/s, the diagram power and the diagram efficiency. **(6)**

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH.], MAY – 2011

Paper Code : ETME 210	*Subject : Operations Research*

Time : 3 Hours *Maximum Marks : 75*

Note : Attempt Five questions including Q.No.1 which is compulsory.
Requirements : Graph paper/Statistical Table.

Q. 1. (a) A firm manufactures two items. It purchases castings which are then machined, bored and polished. Castings for items A and B cost Rs. 2 and Rs. 3 respectively and are sold at Rs. 5 and Rs.6 each respectively. Running costs of the three machines are Rs.20, Rs.14 and Rs.17.50 per hour respectively. Capacities of the machines are **(5×5=25)**

	Part A	Part B
Machining Capacity	25/hr.	30/hr.
Boring Capacity	28/hr.	35/hr.
Polishing Capacity	35/hr.	23/hr.

Formulate the L.P. model to determine the product mix that maximizes the profit.

(b) Write the dual of the primal –

Maximize $Z = 3x_1 + x_2 + 2x_3 - x_4$

Subject to $2x_1 - x_2 + 3x_3 + x_4 = 1$

$x_1 + x_2 - x_3 + x_4 = 3$

$x_1, x_2 \geq 0$ and x_3, x_4 unrestricted in sign

(c) Draw the following network and find out the time ϕ for completion of the project.

Activity	Time duration	Immediate Predecessor
A	6	–
B	8	–
C	3	B
D	6	A, B
E	12	A, B
F	10	B
G	8	E, D, F
H	8	D, E
I	6	E, F
J	12	H, G, I, C

(d) A manufacturing company processes 6 different jobs on two machines A and B. Number of units of each job and its processing times on A and B are given in the following table. Find the optimal sequence and total minimum elapsed time.

Job No.	No. of units of each Job	Processing time	
		Machine A (minutes)	Machine B (minutes)
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

(e) Reduce the following game by dominance and find the game value :

		Player B			
		I	II	III	IV
	I	3	2	4	0
	II	3	4	2	4
Player A	III	4	2	4	0
	IV	0	4	0	8

Q. 2. Maximize : $Z = x_1 + 2x_2 + 3x_3 - x_4$ **(12.5)**

Subject to : $x_1 + 2x_2 + 3x_3 = 15$

$2x_1 + x_2 + 5x_3 = 20$

$x_1 + 2x_2 + x_3 + x_4 = 10$

Q. 3. Find the basic feasible solution of the following transportation problem. Also find the optimal transportation plan. **(12.5)**

	1	2	3	4	5	Available
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	

Q. 4. An airline that operates 7 days a week has the timetable shown below. Crew must have a minimum layover of 5 hours between flights. Obtain the pairing of flights that minimizes layover time away from home assuming that the crew can be based at either of the two cities. The crew will be based at the city that results in smaller layover. **(12.5)**

Delhi-Jaipur			Jaipur-Delhi		
Flight No.	Depart	Arrive	Flight No.	Depart	Arrive
1.	7.00 AM	8.00 AM	101	8.00 AM	9.15 AM
2.	8.00 AM	9.00 AM	102	8.30 AM	9.45 AM
3.	1.30 PM	2.30 PM	103	12Noon	1.15 PM
4.	6.30 PM	7.30 PM	104	5.30 PM	6.45 PM

Q. 5. The time estimates (in weeks) for the activities of a PERT network are given below : (12.5)

Activity	to	tm	tp
1 – 2	1	1	7
1 – 3	1	4	7
1 – 4	2	2	8
2 – 5	1	1	1
3 – 5	2	5	14
4 – 6	2	5	8
5 – 6	3	6	15

(a) Draw the project network and identify all the paths through it.

(b) What is the probability that the project will be completed at least 4 weeks earlier than expected time?

(c) If the project due date is 19 weeks, what is the probability of not meeting the due date?

(d) What should be the scheduled completion time for the probability of completion to be 90%?

Q. 6. A duplicating machine maintained for office use is used and operated by people in office who need to make copies, mostly secretaries. Since the work to be copied varies in length (number of pages of the original) and copies required, the service rate is randomly distributed, but it does approximate a Poisson having a mean service rate of 10 jobs per hour. Generally the requirements for use are random over the entire 8-hour working but arrive at a rate of 5/hour. Several people have noted that a waiting line develops occasionally and have questioned the policy of maintaining only one unit. If the time of a secretary is valued at Rs.3.50 per hour, then determine – (12.5)

(a) equipment utilization.

(b) the percent time an arrival has to wait.

(c) average waiting time of an arrival in the system

(d) the average cost due to waiting and operating the machine.

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH.]– MAY-JUNE 2011

Paper Code: ETME212 **Subject: LAN & Networking**

Time : 3 Hours **Maximum Marks : 75**

Note: Attempt five questions including Q.no.1 which is compulsory.

Q1 Answer the following:-
(a) Mention various components of internet. (2)
(b) Compare guided and unguided transmission media. (2)
(c) Mention any two physical layer features of each of the following:- (2)
(i) Fast Ethernet (ii) Gigabit Ethernet
(d) Explain the working mechanism of virtual LAN. (2)
(e) Mention any four features of ISP. (2)
(f) Compare narrowband ISDN and broadband ISDN. (3)
(g) Explain four main services features of network security. (2)

Q2 (a) Compare OSI and TCP/IP reference models. (6)
(b) Explain the features of repeater, hub, bridge and switch. Draw a network to connect all the above connecting networking devices. (5)
(c) Explain services of MAC layer. (4)

Q3 (a) Explain features of radio waves and micro waves in unguided transmission media. (5)
(b) Mention flow control and error control issues in data link layer. (5)
(c) Compare static and dynamic channel allocation in LANs. (5)

Q4 (a) Explain persistent and non-persistent CSMA protocols. (5)
(b) Consider a building with CSMA/CD network with capacity 1Gbps over 1km cable with not repeaters. The signal speed in the cable is 2,00,000km/sec. What is the minimum frame size? (4)
(c) Explain characteristics features of the following:- (6)
(i) IEEE 802.4 (ii) IEEE 802.5 (iii) IEEE 802.11

Q5 (a) Compare distance vector routing and link state routing in network layer. Give their respective performance parameters. (4)
(b) Give the packet format of IPV6. (3)
(c) An organization is granted the block 211.17.180.0/24. The administrator wants to create 32 subnets. (8)
(i) Find the subnet mask.
(ii) Find the number of addresses in each subnet.
(iii) Find the first and last addresses in subnet 1.
(iv) Find the first and last addresses in subnet 32.

Q6 (a) Explain the working mechanism of encryption and decryption techniques in network security. (5)
(b) Explain any one of the following application layer protocols:- (5)
(i) DNS (ii) HTTP
(c) Explain the features of broadband internet connection and give its configuration. (5)

Q7 Write short notes on **any three** of the following:- (5x3=15)
(a) STP and UTP cables
(b) Unicast and multicast routing
(c) Telnet and FTP
(d) Subnetting and Supernetting
(e) Key management in encryption and decryption.

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END TERM EXAMINATION

FOURTH SEMESTER [B.TECH.], MAY – 2011

Paper Code : ETMA214	*Subject : Numerical Analysis & Programming*
Paper Id :	

Time : 3 Hours *Maximum Marks : 75*

Note : Question 1 is compulsory. Attempt One question from each unit.

Q. 1. (a) Describe Newton-Raphson Method and show that it has quadratic convergence. **(5×5)**

(b) Derive Newton's divided differences formula and show that when the values of x are equally spaced, this reduces to Newton's forward interpolation formula.

(c) What are the advantages of numerical integration over the analytical integration. Derive trapezoidal formula of numerical integration. Why is it named so?

(d) Describe Euler's method for solving a differential equation

$$\frac{dy}{dx} = f(x,y), \quad y(x_0) = y_0$$

Give its geometrical interpretation also.

(e) What are the advantages of numerical methods of solving a system of lined equations over the direct methods. Describe a such method of your choice.

UNIT-I

Q. 2. (a) Lise Regula-Falsi method to find a real root of the equation $x \log_{10} x = 1.2$ correct to four decimal places. **(6.5)**

(b) Evaluate the following correct to four decimal places by Newton's-Raphson method.

(a) $(30)^{-1/5}$ (b) $\sqrt[3]{24}$ **(6)**

Q. 3. (a) Solve the following system of linear equations using Gauss-Jacobi method upto four iterations.

$2x + y + z = 5,\ 3x + 5y + 2z = 15,\ 2x + y + 4z = 8$ **(6)**

(b) From the following table, estimate the number of students who obtained less than 45 marks.

Marks	:	30–40	40–50	50–60	60–70	70–80
No. of Students	:	31	42	51	35	31

(6.5)

UNIT-II

Q. 4. (a) Evaluate P(z) tor z = 1.235 from the following data using an appropriate difference formula.

z	:	1.00	1.05	1.10	1.15	1.20	1.25
P(z)	:	0.6826	0.7062	0.7286	0.7498	0.7698	0.7887

(6)

(b) Find an approximate value of $\int_0^{\pi/2} \sqrt{\cos\theta}\ d\theta$ using Simpson's 1/3 rule by dividing the interval into six subintervals. **(6.5)**

Q. 5. (a) Estimate the length of the arc of the curve $3y = x^3$ from (0, 0) to (1, 1/3) using Simpson's 1/3 rule by taking h= 0.125. **(6.5)**

(b) Derive Lagrange's interpolation formula. Apply it to find interpolation polynomial to fit the following data :

x	:	0	1	2	3
$e^x - 1$	:	0	1.72	6.39	19.09

(6)

UNIT-III

Q. 6. (a) Using Picard's method obtain a solution upto the fifth approximation of the equation $\frac{dy}{dx} = y + x,\ y(0) = 1$. Verify your answer by solving the given differential equation analytically. **(6)**

(b) Apply Runge-Kutta method to find y (0.2) in steps of 0.1, if $\frac{dy}{dx} = x + y^2,\ y(0) = 1.$ **(6.5)**

Q. 7. (a) Apply Milne's method to find a solution of the differential equation $\frac{dy}{dx} = x + y, y(0) = 1$ in the interval [0, 0.4] in steps of h= 0.1. It is given that
$y(0.1) = 1.1103,\ y(0.2) = 1.2428,\ y(0.3) = 1.3997$ **(6.5)**

(b) Given $\frac{dy}{dx} = x + y, y(0) = 1$. Use modified Euler's method to find an approximate value of y(0.2) by taking h=0.1, correct to four decimal places. **(6)**

UNIT-IV

Q. 8. (a) Write a program in C++ to find a root of the equation $e^x = 4x$ near to 2 using Newtons-Raphson method. **(6)**

(b) Write a program in C++ for solving a system of simultaneous linear equations in three variables of your choice using Gauss-Seidal method. **(6.5)**

Q. 9. (a) Write a program to compute the value of π from the integral

$\int_0^1 \frac{dx}{1+x^2}$; taking h = 1/3 using Simpson's 1/3 rule. **(6)**

(b) Write a program to find y(0.2) when $\frac{dy}{dx} = y - x, y(0) = 2$ using Runge-Kutta method. **(6.5)**

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