

II B.Tech. I Semester Regular Examinations, January 2014  
**Fluid Mechanics and Hydraulic Machines**  
 (EEE)

Max. Marks: 70

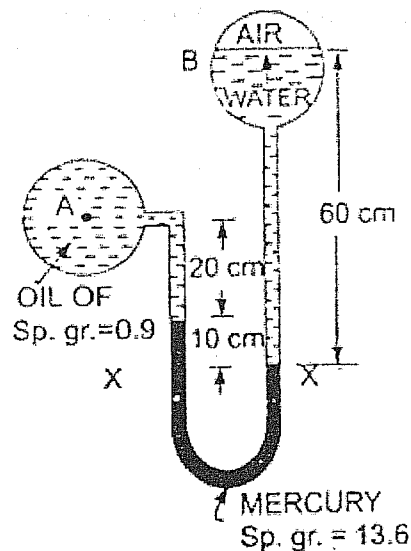
Time: 03 Hours

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Answer any five questions

All Questions carry equal marks (14 Marks each)

1. a. Define the following terms (i) Weight density and specific volume 4M
- b. A differential manometer is connected at the two points A and B of two pipes are shown below. The pipe A contains a liquid of specific gravity = 1.5 while pipe B contains a liquid of specific gravity = 0.9. The pressures at A and B are  $0.9806 \times 10^5$  Pa and  $1.7658 \times 10^5$  Pa respectively. Find the difference in mercury level in the differential manometer. 10M



2. a. Explain the terms (i) Stream line (ii) streak line 6M
- b. Derive Bernoulli's equation for the flow of an incompressible frictionless fluid from considering of momentum. 6M
3. a. List out flow measuring instruments. 2M
- b. A horizontal venturimeter with inlet diameter 200mm and throat diameter 100mm is used to measure the flow of water. The pressure at inlet is  $1.7658 \times 10^5$  MPa and the vacuum pressure at the throat is 300mm of mercury. Find the discharge of water through venturimeter. Take  $C_d = 0.98$ . 12M
4. A 750mm diameter jet having a velocity of 30m/sec strikes a flat plate, the normal of which is inclined at  $45^\circ$  to the axis of the jet. Find the normal pressure on the plate (i) when the plate is stationary and (ii) when the plate is moving with a velocity of 15m/s and away from the jet. Also determine the power and the efficiency of the jet when the plate is moving. 14M

5. a. Explain the elements of hydro electric power station. 5M
- b. The catchment area at a proposed site for a hydropower plant is  $300 \text{ Km}^2$  and possible head of water is 200 m. The average annual rainfall is 150 cm and the losses are 20%. How much power can be developed? 9M
6. a. Differentiate between impulse and reaction turbine. 7M
- b. Two jets strike the buckets of a pelton wheel which is having shaft power 15.7kW. The diameter of each jet is given as 200mm. if the net head on the turbine is 400m, find the overall efficiency of the turbine. (Take  $C_v = 1.0$ ). 7M
7. a. Define Similitude and enumerate the types of similarities. 5M
- b. What are the characteristics curves of turbine? Explain with neat sketches. 9M
8. a. Explain the working principle of centrifugal pump with a neat sketch. 7M
- b. A centrifugal pump is to discharge  $0.118 \text{ m}^3/\text{s}$  at a speed of 1450 rpm against a head of 30m. The impeller diameter is 250mm its width at outlet is 50mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 7M

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Answer any five questions

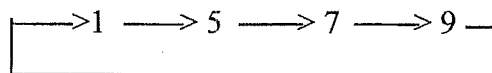
All Questions carry equal marks (14 Marks each)

1. a. Devise scheme for converting base 3 numbers directly to base 9. Use your method to convert the following numbers to base 9 7M  
 $220012112021.102_3$
  - b. Construct a table for a 5-3-2-1 weighted code and write 9371 using this code. 4M
  - b. Convert to Octal and then Binary. 3M  
 i.  $757.25_{10}$     ii.  $356.89_{10}$
  2. a. Write Boolean expression and construct the truth table describing the output of the circuits described by the following logic diagram. 7M
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- b. Express the following functions as a sum of min terms and products of Max terms 4M  
 $F(A,B,C,D) = B^1D + A^1D + BD$
  - c. Show that a positive logic NAND gate is a negative logic NOR gate and vice versa. 3M
  3. a. Reduce the following expression using k-map and implement them in universal logic gates.  $\sum m(0,1,4,5,6,7,9,11,15) + d(10,14)$  7M
  - b. Obtain the minimal expression for  $f = \sum m(1,2,3,5,6,7,8,9,12,13,15)$  using the tabular method. 7M
  4. a. Implement the following logic function using an 8 x 1MUX? 7M  
 $F(A,B,C,D) = \sum m(1,3,4,11,12,13,14,15)$ .
  - b. Design a circuit to convert excess-3 code to BCD code using a 4-bit full-adder. 7M
  5. a. Explain the types of ROMs? 4M
  - b. Explain the programmable Array Logic (PAL) with its basic structure and internal connections in PAL circuits. 10M
  6. a. Explain the conversion of S-R Flip-flop to J-K flip-flop. 7M
  - b. What is a serial adder? Explain its working with the help of a state diagram? 7M

7. a. Explain the procedure of state minimization using the on Technique? 4M
- b. What are the Moore and Melay Machines? Compare them? 4M
- c. Find the equivalence partition and a corresponding reduced machine in standard form for the machine given in table. 6M

PS	NS, Z	
	X=0	X=1
A	F,0	B,1
B	G,0	A,1
C	B,0	C,1
D	C,0	B,1
E	D,0	A,1
F	E,0	F,1
G	E,1	G,1

8. a. Draw the ASM chart for i) SR flip flop and ii) T flip flop 7M
- b. Design a Synchronous state machine to generate the following sequence of states



7M

Represent the machine by ASM chart and display the onset of state 9 with the help of LED. (use JK flip flops).

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Code : 1G233

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)

II B.Tech. I Semester Regular Examinations, January 2014

Electrical Circuits-I

(EEE)

Time: 3 hours

Max Marks: 70

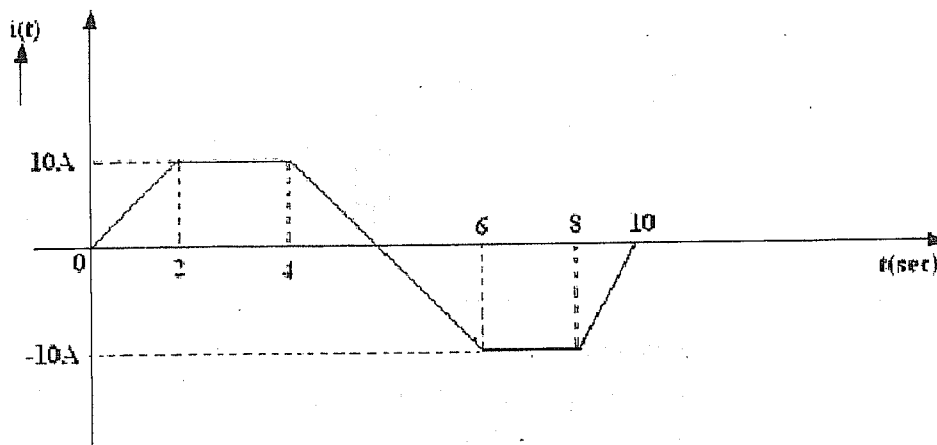
Answer any FIVE of the following

All questions carry equal marks (14 Marks each)

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1. a) Three resistances  $R_{ab}$ ,  $R_{bc}$  and  $R_{ca}$  are connected in delta connection, Derive the expressions for equivalent star connection. 7M

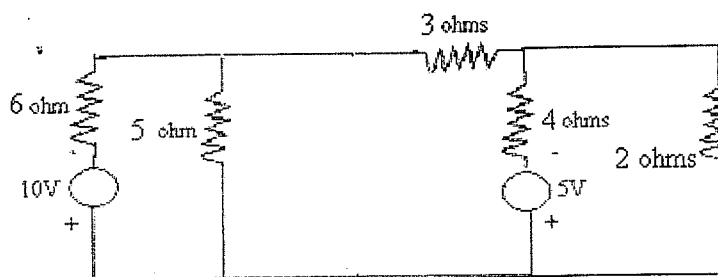
- b) A pure inductance of 5 mH carries a current of the wave form shown in figure. Sketch the waveform of  $V(t)$  and  $P(t)$ . Determine the average value of power.



7M

2. a) By taking any one example write down the procedure to obtain node voltages by using nodal analysis. 7M

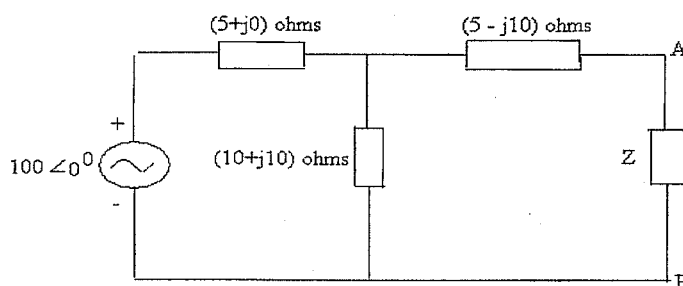
- b) By using nodal analysis find the current flowing through 3 ohms resistor.



7M

3. a) Derive the expression for RMS value of alternating current wave  $I = I_m \sin \omega t$ . 7M
- b) Write down the advantages and disadvantages of AC system over DC system. 7M
4. a) Show that the resonant frequency  $\omega_0$  of an RLC series circuit is the geometric mean of  $\omega_1$  and  $\omega_2$ , the lower and upper half power frequencies respectively. 7M
- b) A voltage  $V = 50 \angle 0^\circ$  V is applied to a series circuit consisting of fixed inductive reactance  $X_L = 5$  ohms and a variable resistance  $R$ . Sketch the admittance and current locus diagrams. 7M

5. a) Derive the relation between Phase and Line values of a balanced three phase star connected system with neat circuit diagram. 7M
- b) Write down the advantages and disadvantages of Three phase system over Single phase system. 7M
6. a) What is an electric circuit? What is a magnetic circuit? Make a comparison between electric circuit and magnetic circuit. 7M
- b) Coil 1 of a pair of coupled coils has a continuous current of 5 A, and the corresponding fluxes  $\phi_{11}$  and  $\phi_{12}$  are 0.2 and 0.4 mWb respectively. If the turns are  $N_1 = 500$  and  $N_2 = 1500$ , find  $L_1$ ,  $L_2$ ,  $M$  and  $k$ . 7M
7. a) State and explain Superposition theorem for AC network by taking any one example. 7M
- b) When the maximum power will be flowing through the impedance  $Z$  ? and also find the maximum power delivered the load impedance  $Z$  for the following network. 7M



8. a) State and explain reciprocity theorem. 7M
- b) State and explain Compensation theorem for AC network by taking any one example. 7M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
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II B.Tech. I Semester Regular Examinations, January 2014

Electrical Machines-I

(EEE)

Time: 3 hours

Max Marks: 70

Answer any FIVE of the following  
All questions carry equal marks (14 Marks each)

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1. a) What is field energy? What is the relation of mechanical energy and field energy? Relate them in a linear system. 7M
- b) Explain the doubly excited system? Explain the various losses in it. 7M
2. Give the developed view of a 13 slot, 2 coil sides/slot, 4-pole, D.C. wave winding. 14M
3. a) Sketch and explain the load characteristics of DC generators. Also give their fields of application. 7M
- b) A separately excited generator with constant excitation is connected to a constant load. When the speed is 1200 rpm, it delivers 120A at 500V. At what speed will the current be reduced to 60A ? Armature resistance is 0.1 ohm. Armature reaction may be ignored. 7M
4. a) What are the causes of sparking in a d. c. machine? Explain how commutation is improved by use of inter poles. 6M
- b) A 22.38 kW, 400-V, 2-pole wave-wound D.C shunt motor has 840 armature conductors and 140 commutator segments. Its full-load efficiency is 88% and the shunt field current is 1.50A. If brushes are shifted backward through 1.5 segments from the geometrical neutral axis, find the demagnetizing and distorting amp-turn /pole. 8M
5. What is parallel operation? How do you connect the two shunt generators in parallel? Explain briefly? (3+3+8)M
6. a) Explain with neat sketch construction and working principle of DC Motor. 7M
- b) A 6-pole DC motor has a wave connected armature with 87 slots, each slot containing 6 conductors. The flux per pole is 25 milli Weber and the armature has a resistance of 0.13 ohm when the motor is connected to 240V supply and the armature draws a current of 80A driving a load of 15KW.  
Calculate  
i. Speed            ii. Armature Torque and            iii. Shaft Torque. 7M
7. a) Give the reasons for using the Starters to start DC motors and draw the circuit of 3 point starter, explain its operation. 7M
- b) A 200 V DC shunt motor takes 30 A at rated voltage and runs at 800 RPM. Its field resistance is 100 ohms. If an additional resistance of 20 ohms is inserted in the armature circuit, compute the motor speed and the line current in case the load torque varies as the square of the speed. 7M
8. a) What are the various methods of finding inertia of a motor? Explain any one method to calculate inertia experimentally? 7M
- b) Explain the various losses taking place in DC machines. With the help of these losses draw the power flow diagram for a DC Motor. 7M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
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*II B.Tech. I Semester Regular Examinations, January 2014*

**Electromagnetic Fields**

(EEE)

**Time: 3 hours**

**Max Marks: 70**

*Answer any FIVE of the following  
All questions carry equal marks (14 Marks each)*

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1. a) State and explain Gauss's law of electromagnetics in integral form. 7M  
b) Derive and explain Maxwell's first equation. 7M
2. a) Derive and explain Maxwell's second equation. 7M  
b) An electric dipole located at the origin in free space has a moment  $p = 3a_x - 2a_y + a_z$  nC. m. (a) Find V at  $P_A(2, 3, 4)$ . (b) Find V at  $r = 2.5$ ,  $\theta = 30^\circ$ ,  $\phi = 40^\circ$ . 7M
3. a) Derive Laplace's equation from fundamentals. 7M  
b) A parallel plate capacitor consists two square plate metals with 1000 mm side and separated by 10 mm. A slab of sulphur ( $\epsilon_r = 4$ ) 8 mm thick is placed on the lower plate and air gap of 4 mm. Find the capacitance of a capacitor. 7M
4. a) State Biot – Savarat's law for the magnetic field  $\bar{B}$  due to a steady line current element in free space. 7M  
b) Derive and explain the relation between Magnetic flux, Magnetic flux density and Magnetic field Intensity. 7M
5. a) State and explain point form of Ampere's circuital law. 7M  
b) Derive and explain Maxwell's third equation. 7M
6. a) Derive the torque on a current loop placed in a magnetic field. 7M  
b) A single-phase circuit comprises two parallel conductors A and B, each 1 cm diameter and spaced 1 m apart. The conductors carry current of 100 A and -100 A respectively. Determine the field intensity at the surface of each conductor and also in space exactly midway between A and B. 7M
7. a) Derive the self-inductance of a solenoid. 7M  
b) Evaluate the inductance of a solenoid of 2800 turns wound uniformly over a length 0.6 m on a cylindrical paper tube 4 cm in diameter. the medium is air. 7M
8. a) Derive the expression of one of the Maxwell's equation  $\text{Curl}(\mathbf{E}) = \frac{-\partial b}{\partial t}$  7M  
b) State and explain Poynting theorem and Poynting vector. 7M

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Code : 1GC32

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET  
(AUTONOMOUS)

II B.Tech. I Semester Regular Examinations, January 2014

Engineering Mathematics

(Common to EEE & ECE)

Time: 3 hours

Max Marks: 70

Answer any FIVE of the following  
All questions carry equal marks (14 Marks each)

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1. a) Find the rank of  $\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$

b) Find the values of a and b for which the equation  $x+ay+z=3$ ,  $x+2y+2z=b$ ,  $x+5y+3z=9$  are consistent. When will these equations have a unique solutions?

2. a) Find a real root of  $xe^x=3$ , using regular falsi method.

b) Using Newton's method, compute  $\sqrt{41}$  correct to 4 decimal places.

3. Given  $y' = x(x^2 + y^2)e^{-x}$ ,  $y(0)=1$ . Find y at  $x=0.1$ ,  $0.2$  and  $0.3$ . by taylors series method and compute  $y(0.4)$  by Milne's method.

4. a) Fit a straight line to the following data

Year x	1961	1971	1981	1991	2001
Production y	8	10	12	10	16

And find expected production in 2006.

b) Find the curve of best fit of the form  $y=ab^x$  to the following data by the method of least squares

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

5. Solve a)  $p \tan x + q \tan y = \tan z$ .

b)  $x(y - z)p + y(z - x)q = z(x - y)$ .

6. a) Find the Fourier series to represents  $f(x)=|x|$  when  $-\pi < x < \pi$  and deduce that

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}.$$

- b) Find the half range cosine series for the function  $f(x)=x$ , when  $0 < x < \pi$
7. a) Find Fourier sin and cosine transform of  $f(x)=\frac{e^{-ax}}{x}$
- b) Find Fourier sin and cosine transform of  $2e^{-5x}+5e^{-2x}$
8. a) Find the maximum n such that the probability of getting no head in tossing in fair coin in n times is greater than 0.1.
- b) A random sample of 400 items is found to have mean 82, and standard deviation 18, find the maximum error of estimation at 95% confidence interval?

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