| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G233**

II B.Tech. I Semester Supplementary Examinations November 2018

# Electrical Circuits – I

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

*********

## UNIT–I

1. a) Explain the star-to-delta and delta-to-star transformation for a resistive network. 7M

   b) Find a single source equivalent at the terminals of a circuit shown in fig.1

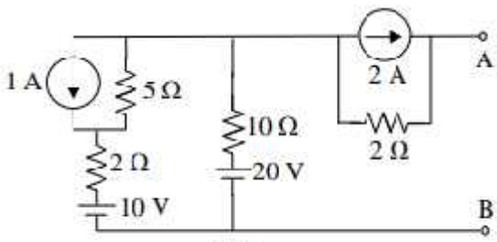


Fig.1 7M

**OR**

2. a) Use the nodal analysis to determine voltage at node 1 and the power supplied by the dependent current source in the network shown in fig:2.

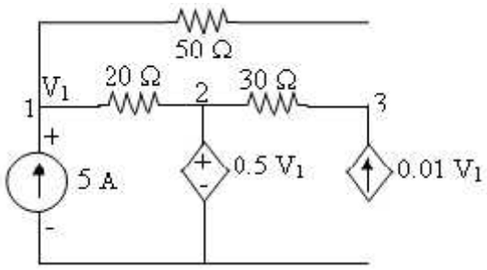


Fig.2 7M

   b) Describe the procedure to construct the dual of a network with an example. 7M

## UNIT–II

3. a) A series RLC circuit with R=100Ω , L = 0.5H, C=40μF has an applied voltage of 100 0 with variable frequency. Calculate the resonance frequency, current at resonance and voltage across R, L, and C. Also calculate the Q-factor, upper and lower cutoff frequencies. 7M

   b) Give the detailed comparison of series and parallel resonant circuits. 7M

**OR**

4. a) A coil having a resistance of 20 ohms and an inductance of 0.2 H is connected in series with a 50 μF capacitor across a 250 V, 50 Hz supply. Calculate (i) the current (ii) the power (iii) the power factor (iv) the voltage across the coil and capacitor. Draw the phasor diagram showing the current and various voltages. 8M

   b) Show that power consumed in a purely inductive circuit is zero when sinusoidal voltage is applied across it. 6M

## UNIT–III

5. a) State and explain the Maximum power transfer theorem. 7M

   b) Find $V_L$ in the circuit shown in fig.3, using superposition theorem.

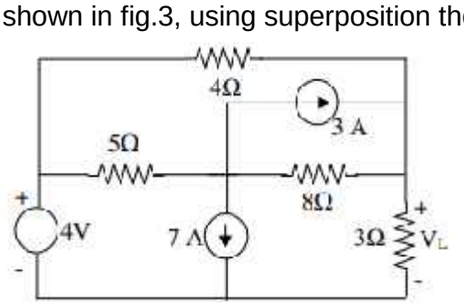


Fig.3 7M

**OR**

6. a) State and explain Thevenin's theorem. 7M

   b) For the network shown in fig.4, find the current through 1.375 ohms resistor and hence verify reciprocity theorem.

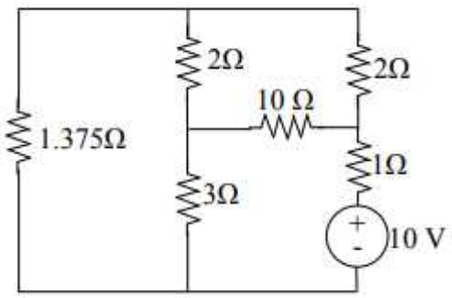


Fig.4 7M

**UNIT–IV**

7. a) The following equations give the voltages $V_1$ and $V_2$ at the two ports of a two port network, $V_1=5I_1+2I_2$ , $V_2=2I_1+I_2$ ; A load resistance of 3Ω is connected across port-2. calculate the input impedance. 7M

   b) Explain Two port network parameters using transformed variables. 7M

**OR**

8. a) Find the equivalent y parameter network for the T-network shown in fig.5.

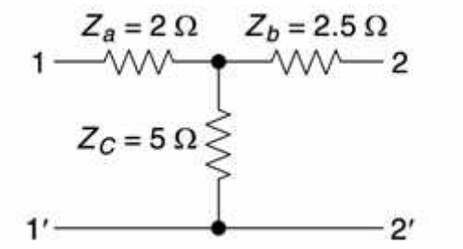


Fig.5 7M

   b) Find the equivalent z parameter network for the π-network shown in fig.6.

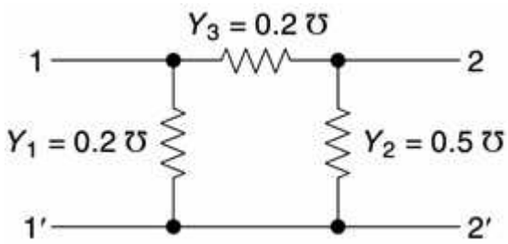


Fig .6 7M

**UNIT–V**

9. a) Two coils connected in series have an equivalent inductance of 0.8 H when connected in aiding, and an equivalent inductance of 0.5 H when the connection is opposing. Calculate the mutual inductance of the coils and coupling coefficient. 7M

   b) Explain Self and Mutual Inductance in coupled magnetic circuits. 7M

**OR**

10. a) Write the procedure to analyze a parallel magnetic circuit. 7M

    b) What is a magnetic circuit? Compare magnetic circuit with an electric circuit. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G234**

II B.Tech. I Semester Supplementary Examinations November 2018

# Electro Magnetic Fields

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

*********

**UNIT–I**

1. a) Prove that E=-▼V?

   b) Derive Maxwell's First equation as applied to the electrostatics using Gauss's law?

**OR**

2. a) State and explain Gauss law in Integral form.

   b) Derive the equation for potential at a point inside a solid sphere having uniform charge density?

**UNIT–II**

3. a) Derive the expression for torque on a dipole?

   b) Derive Laplace Equation from fundamentals.

**OR**

4. Explain the phenomenon of polarization when a dielectric slab is subjected to an electric field with the help of neat sketches. How this phenomenon reduces the electric field inside the dielectric.

**UNIT–III**

5. a) Derive an expression for magnetic field intensity at any point on the axis of a circular current carrying coil?

   b) State and explain Biot-savart's law?

**OR**

6. Using Ampere's circuital law find H due to an infinite sheet of current.

**UNIT–IV**

7. a) Derive the expression for Torque on a current loop placed in a magnetic field.

   b) Derive the boundary conditions for magnetic field intensity and flux density.

**OR**

8. Derive the expression for force between two long parallel current carrying conductors placed in a magnetic field.

**UNIT–V**

9. a) State and explain Faradays laws of electromagnetic induction.

   b) A circular loop of 10 cm radius is located in the x-y plane in a field given by $\overline{B}$ =0.5cos377t($3a_y$+$4a_z$) Tesla. Find the emf induced in the loop.

**OR**

10. a) Explain the significance of Displacement current?

    b) Find the displacement current density if the magnetic field intensity in free space is given as $H=H_o \sin\theta a_y$ A/m, where $\theta=\omega t-\beta z$ and $\beta$ is a constant quantity. Determine the displacement current density.

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G232**

II B.Tech. I Semester Supplementary Examinations November 2018

# Electrical Machines-I

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT–I**

1. Elucidate the principle of operation and constructional details of a machine, which generates unidirectional voltage with the neat sketch? 14M

**OR**

2. a) Prove that the laminated core reduces eddy current losses. 7M

   b) Write energy balance equation in electromechanical energy conversion devices. 7M

**UNIT–II**

3. a) Discuss the methods to minimize the effect of armature reaction. 7M

   b) Calculate the ampere turns for each commutating pole of an 8 pole with 107 slots, each containing 1000 ampere conductors. The interpole air gap is 1.2 cm. The flux density in the air gap is to be 0.32 T. Neglect iron parts and leakage. 7M

**OR**

4. Explain the importance of series field, interpole and compensating windings in dc compound machine. 14M

**UNIT–III**

5. a) Explain how critical resistance and critical speed of a D.C. generator can be obtained. 7M

   b) Draw the load characteristics of all the D.C generators. 7M

**OR**

6. a) "External characteristics are more drooping in nature for a shunt machine compared to DC separately excited machine" Justify 7M

   b) Explain the process of building up of voltage in self-excited machine. Under what conditions may it fail to build up the voltage? 7M

**UNIT–IV**

7. Explain the various method of speed control used for D.C shunt motor. Discuss their merits & demerits 14M

**OR**

8. a) Explain about series-parallel method of speed control of dc motors. 7M

   b) A 250 V 4 pole shunt motor has armature wave winding with 500 conductors. The armature circuit resistance is 0.25 ohms field resistance is 125 ohm and the flux per pole is 0. 02wb.neglect armature reaction. Find the sped and torque developed if the motor draws 14 A from the mains. 7M

**UNIT–V**

9. a) Explain the procedure to find the stray losses of dc shunt machine. 8M

   b) List the advantages of Indirect test over Direct test. 6M

**OR**

10. a) Compare Swinburne's test and Hopkinson's test conducted on dc machines. List the advantages and limitations of both. 7M

    b) The no load test of a 45kw, 230V dc shunt motor gave the following results: Input current =14A Field current =2.55A Brush drop =2V. Estimate full load current and efficiency. 7M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G539**

II B.Tech. I Semester Supplementary Examinations November 2018

# Fluid Mechanics and Hydraulic Machines

( Electrical and Electronics Engineering )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

*********

## UNIT–I

1. a) A flat plate (Weight = 280 N) of area 0.6 $m^2$ is sliding down an inclined plane (30ºC to the horizontal) with a velocity of 0.36 m/s. A fluid of thickness 1.8 mm is present between the plane and plate. Determine the viscosity of the fluid. 7M

   b) The left leg of a U-tube Mercury manometer is connected to pipeline carrying water. The level of Mercury (Sp. Gravity = 13.6) in the left leg is 1 m below the center of pipeline and the right leg is open to atmosphere. The level of Mercury in the right leg is 0.55 m above that of the left leg, and the space above Mercury in the right leg contains Benzene (Sp. Gravity = 0.9) to a height of 0.4 m. Determine the pipe pressure. 7M

**OR**

2. a) Discuss the influence of the following fluid properties on fluid motion

      i. Viscosity, ii. Specific gravity, iii. Surface tension, iv. Mass density 4M

   b) Derive the differential form of 1D steady-state continuity equation in Cartesian form for an incompressible fluid. 10M

## UNIT–II

3. a) Write down the Euler equation of motion for steady flow along a streamline. State and derive the Bernoulli equation from Euler's equation. List out various assumptions made for the same. 7M

   b) Three pipes are connected parallel to each other. The lengths of pipes are 1800 m, 1500 m, and 1900 m respectively, and the corresponding diameters are 1.25 m, 1 m and 1.4 m respectively. Determine discharge in all the pipes, assuming the discharge at the inlet to be 4.5 $m^3/s$. The friction factor for all the pipes is assumed to be 0.006. 7M

**OR**

4. Gasoline (Sp. Gravity = 0.8) is flowing upward through a vertical pipe, which tapers in diameter from 30 cm to 15 cm. A gasoline mercury differential manometer is connected between 30 cm and l5 cm pipe section to measure its flow rate. The distance between the manometer tapping is 1 m and the gauge reading is 50 cm of mercury. Neglecting the losses between the pipe tapping. Determine the following.

   (i) The differential gauge reading in terms of gasoline head

   (ii) Gasoline flow rate 14M

## UNIT–III

5. a) What do you mean Hydroelectric power plant? Give the basis of selection and classification of these plants. Give the detailed construction and working principle of the Hydroelectric plant. 7M

   b) A Hydroelectric power station is designed to operate at a mean head of 205 m. It is fed by a reservoir having a catchment area of 1000 $km^2$ with an annual rainfall of 125 m of which 80% is available for power generation. The expected load factor is 75%. Allowing a head loss of 5 m and assuming the Turbine and Generator efficiency to be 90% and 95% respectively. Calculate the suitable rating of the power station in MW. Comment on the type of Turbine to be used to maintain the power station rating. 7M

**OR**

6. a) A jet of water moving at 60 m/s is deflected by a vane moving at 25 m/s in a direction 30º to the direction of the jet. The water jet leaves the blades normally to the motion of vanes. Draw the inlet and exit velocity triangles for the vane. Assuming the relative velocity at the exit to be 85% that of the inlet and no shock at the inlet, determine the following.
   (i) The vane angle at inlet and exit
   (ii) The work done per kg of water entering the vanes 10M

   b) State Impulse-Momentum principle, and show that, the rate of change of momentum is an impulsive force. 4M

**UNIT–IV**

7. a) A Turbine develops 12000 kW power under a head of 30 m at 150 rpm. Determine the following. (i) Specific speed , (ii) Normal speed and (iii) Power output under a head of 25 m 7M

   b) Give the basis of selection of Turbines. List out the effect of different parameters on the performance of Turbines. Plot the variation of following parameters for the Pelton Turbine, at the constant head. Explain the nature of each plot.
   (i) Speed Vs Discharge (ii) Speed Vs Power
   (iii) Speed Vs Efficiency 7M

**OR**

8. A Pelton wheel turbine working under a head of 359 m runs at 750 rpm and generates 9560 kW. The overall efficiency of the turbine = 85%, Jet ratio = 6, Coefficient of velocity = 0.985, Speed ratio = 0.45, No. of poles in the generator = 36. Draw the velocity diagram of the Turbine, and determine the following.
   (i) Runner diameter (ii) Jet diameter
   (iii) No. of jets required (iv) Synchronous speed of the generator
   (v) Specific speed of the Turbine

   Assume suitable data, if necessary. 14M

**UNIT–V**

9. The outer diameter of the impeller of a Centrifugal pump is 400 mm and the outlet width is 50 mm. The pump is running at 800 rpm and working against a head of 15 m. The vane angle at the outlet is 40° and the manometry efficiency is 75%. Determine the following.
   (i) Flow velocity at the outlet
   (ii) The velocity of water leaving the vane
   (iii) Angle made by the absolute velocity with the direction of motion at the outlet
   (iv) Discharge of pump 14M

**OR**

10. A single acting reciprocating pump has a piston diameter of 0.15 m and a stroke length of 0.3 m. The center of the pump is 5 m above the level of water in the sump and 33 m below the delivery water level. The lengths of suction and delivery pipes are 6.5 m and 39 m respectively and both the pipes have the same diameter of 75 mm. if the pump is working at 30 rpm, determine the following.
   (i) Pressure head on the piston at the beginning, middle, and end of both suction and delivery stroke
   (ii) Power required to drive the pump

   Take atmospheric pressure as 10.3 m of water and Darcy's friction factor for both the pipes as 0.04. 14M

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5GC32**

II B.Tech. I Semester Supplementary Examinations November 2018

# Mathematical Methods-III

( Common to EEE & ECE )

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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## UNIT–I

1. a) Determine the rank of the matrix $\begin{bmatrix} 0 & 1 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & 2 & 0 \end{bmatrix}$

   b) Find whether the following system of equations are consistent. If so, solve them

   X + 2y + 2z = 2 ; 3x - 2y - z = 5 ; 2x - 5y + 3z = - 4 ; x + 4y +6z = 0

**OR**

2. a) Find the Eigen values and the corresponding Eigen vectors of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & 6 \\ -1 & -2 & 0 \end{bmatrix}$

   b) Test for consistency and solve $2x - 3y + 7z = 5$; $3x + y - 3z = 13$; $2x + 19y - 47z = 32$

## UNIT–II

3. a) Find a real root of $x^3 - x^2 - 1 = 0$ by Bisection method

   b) Using Euler's method find an approximate value of y corresponding to $x = 1$, given $\frac{dx}{dy} = x + y$ and $y = 1$ when $x = 0$

**OR**

4. Using R-K method of order 4, find $y$ for $x = 0.1, 0.2, 0.3$ given that $\frac{dx}{dy} = xy + y^2$, $y(0) = 1$. Continue the solution at $x = 0.4$ using Milne's method.

## UNIT–III

5. a) Find the cubic polynomial which takes the following values

| x | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| f(x) | 1 | 2 | 1 | 10 |

And hence find f(4).

   b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$ from the following table:

| $x$ | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
|---|---|---|---|---|---|---|---|
| $y$ | 7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |

**OR**

6. a) Estimate the value of $f(22)$ and $f(42)$ from the following table by Newton's forward and backward interpolation formula:

| $x$ | 20 | 25 | 30 | 35 | 40 | 45 |
|---|---|---|---|---|---|---|
| $f(x)$ | 354 | 332 | 291 | 260 | 231 | 204 |

b) Compute $f'(x)$ and $f''(x)$ at $x=15$

| $x$ | 15 | 17 | 19 | 21 | 23 | 25 |
|---|---|---|---|---|---|---|
| $f(x)$ | 3.873 | 4.123 | 4.359 | 4.583 | 4.796 | 5.800 |

**UNIT–IV**

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

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| y | 9 | 8 | 10 | 12 | 11 | 13 | 14 | 16 | 5 |

b) Form the partial differential equation by eliminating a and b from $2z=(x-a)^{1/2}+(y-a)^{1/2}+b$.

**OR**

8. a) The pressure and volume of a gas are related by the equation $PV^{¥} = k$, where ¥ and $k$ being constants. Fit this equation to the following set of observations.

| $P$(kg/cm2) | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
|---|---|---|---|---|---|---|
| $V$ (liters) | 1.62 | 1.00 | 0.75 | 0.62 | 0.52 | 0.46 |

b) Solve $z^2 = p\,q\,x\,y$ by Charpit's method

**UNIT–V**

9. Find the Fourier series of $f(x)=\begin{cases}-®, -® < x < 0\\ x, 0 < x < ®\end{cases}$ and hence show that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+---+\infty=\frac{®^2}{8}$

**OR**

10. a) Obtain a half range cosine series for $f(x)=(x-1)^2$ in interval $0<x<1$. Deduce the sum of series $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+---+\infty=\frac{®^2}{8}$

b) Find the Fourier sine transform of the function $f(x)=\frac{e^{ax}}{x}, a>0$.

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| Hall Ticket Number : | | | | | | | | | | |
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**R-15**

**Code: 5G231**

II B.Tech. I Semester Supplementary Examinations November 2018

# Switching Theory and Logic Design

( Electrical and Electronics Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT–I**

1. a) Convert the following Hexadecimal numbers into their binary equivalents:
   i. $(A23.4E)_{16}$
   ii. $(F23)_{16}$
   iii. $(0.45B)_{16}$ 12M

   b) Encode the binary word into a 7-bit even Hamming code:1010 4M

**OR**

2. a) Represent the following decimal numbers in 2's complement representation using 8- bits:
   i. -44
   ii. 64
   iii. -89 9M

   b) State and prove the Boolean theorems. 6M

**UNIT–II**

3. a) Simplify the following using Boolean algebra:
   i. $Y(A,B,D) = (\overline{A}+B)(A+B+D)\overline{D}$
   ii. $Y(A,B,C) = \sum_m (0,2,4,6)$ 7M

   b) Simplify the following using K-map and implement it using basic gates only.
   $f(A,B,C,D) = \sum_m (0,2,8,10) + d(4,6,7,11,15)$ 7M

**OR**

4. a) Minimize the following logic function using K-map and implement using logic gates. $Y(A,B,C,D) = \sum_m (0,1,2,3,4,7,8,9,10,11,12,14)$ 7M

   b) What is meant by standard SOP form? Convert the given function in standard SOP form. $f(A,B,C,D) = \overline{A} + BC\overline{D} + A\overline{C}$. 7M

**UNIT–III**

5. a) Distinguish between the multiplexer and de-multiplexer. 5M

   b) Implement the following two Boolean functions with a PLA.
   $F_1(A,B,C) = \sum_m (0,1,2,4)$
   $F_2(A,B,C) = \sum_m (0,5,6,7)$ 9M

**OR**

6. a) Implement a full adder using a 3-line-to-8 line decoder. 7M

   b) Design a combinational circuit using PROM, the circuit accepts a 3-bit binary number and generates its equivalent XS-3 code. 7M

**UNIT–IV**

7. a) How does a J-K flip-flop differ from an S-R flip-flop in its operation? What are its advantages over an S-R flip-flops? 4M

   b) Design a synchronous mod-6 counter using J-K flip-flop. 10M

**OR**

8. a) What are the various methods used for triggering the flip-flops? 2M

   b) Design synchronous 3-bit up-down counter using J-K Flip-flop. 10M

**UNIT–V**

9. a) Write the comparison between the Mealy machines and Moore machines. 4M

   b) For the state table of the machine given below, find the equivalence partition and a corresponding reduced machine in the standard form.

| PS | NS,Z | |
|---|---|---|
| | X=0 | X=1 |
| ***A*** | ***D,0*** | ***H,1*** |
| ***B*** | ***F,1*** | ***C,1*** |
| ***C*** | ***D,0*** | ***F,1*** |
| ***D*** | ***C,0*** | ***E,1*** |
| ***E*** | ***C,1*** | ***D,1*** |
| ***F*** | ***D,1*** | ***D,1*** |

10M

**OR**

10. a) Write the salient feature of ASM chart 4M

    b) For the state table of the machine given below, find the equivalence partition and a corresponding reduced machine in the standard form.

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

10M

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