

Date.....

Digital Systems -

(Q) (1) $163.789_{10} = (?)_8$

$$\begin{array}{r} \cancel{163} \\ \cancel{81} \\ \cancel{40} \\ \cancel{20} \\ \cancel{10} \\ \cancel{5} \\ \cancel{4} \\ \cancel{2} \\ \cancel{1} \\ \cancel{0} \end{array} \quad | \quad \begin{array}{r} 163 \\ 81 \\ 40 \\ 20 \\ 10 \\ 5 \\ 4 \\ 2 \\ 1 \\ 0 \end{array}$$

$$0.789 \times 8 = 6.312$$

$$0.312 \times 8 = 2.992 \quad \boxed{6}$$

$$0.496 \times 8 = 3.968$$

$$0.968 \times 8 = 7.728 \quad \boxed{2}$$

$$0.7244 \times 8 = 5.992 \quad \boxed{5}$$

(2) $(1001101.0101)_2 = (?)_8$

$$3) (1 \times 2^8 + 1 \times 2^7 + 0 + 0 + 1 \times 2^3 + 1 \times 2^2 + 0 + 1) \cdot (0 + 1 \times 2^{-2} + 0 + 1 \times 2^{-4})$$

$$3) (256 + 128 + 8 + 4 + 1) \cdot (0.25 + 0.625)$$

$$= (397.875)_8$$

Spiral

Teacher's Sign

Date.....

(1) $(1667)_{10} = (?)_2$

$\begin{array}{r} 2 \\ \overline{) 1667} \\ -16 \\ \hline 67 \\ -64 \\ \hline 3 \end{array}$

$\begin{array}{r} 2 \\ \overline{) 3} \\ -2 \\ \hline 1 \end{array}$

$1 \times 2^0 = 1$

$1 \times 2^1 = 2$

$1 \times 2^2 = 4$

$1 \times 2^3 = 8$

$1 \times 2^4 = 16$

$1 \times 2^5 = 32$

$1 \times 2^6 = 64$

$1 \times 2^7 = 128$

$1 \times 2^8 = 256$

$1 \times 2^9 = 512$

$1 \times 2^{10} = 1024$

$1 \times 2^{11} = 2048$

$1 \times 2^{12} = 4096$

$1 \times 2^{13} = 8192$

$1 \times 2^{14} = 16384$

$1 \times 2^{15} = 32768$

$1 \times 2^{16} = 65536$

$1 \times 2^{17} = 131072$

$1 \times 2^{18} = 262144$

$1 \times 2^{19} = 524288$

$1 \times 2^{20} = 1048576$

$1 \times 2^{21} = 2097152$

$1 \times 2^{22} = 4194304$

$1 \times 2^{23} = 8388608$

$1 \times 2^{24} = 16777216$

$1 \times 2^{25} = 33554432$

$1 \times 2^{26} = 67108864$

$1 \times 2^{27} = 134217728$

$1 \times 2^{28} = 268435456$

$1 \times 2^{29} = 536870912$

$1 \times 2^{30} = 1073741824$

$1 \times 2^{31} = 2147483648$

$1 \times 2^{32} = 4294967296$

$1 \times 2^{33} = 8589934592$

$1 \times 2^{34} = 17179869184$

$1 \times 2^{35} = 34359738368$

$1 \times 2^{36} = 68719476736$

$1 \times 2^{37} = 137438953472$

$1 \times 2^{38} = 274877906944$

$1 \times 2^{39} = 549755813888$

$1 \times 2^{40} = 1099511627776$

$1 \times 2^{41} = 2199023255552$

$1 \times 2^{42} = 4398046511104$

$1 \times 2^{43} = 8796093022208$

$1 \times 2^{44} = 17592186044416$

$1 \times 2^{45} = 35184372088832$

$1 \times 2^{46} = 70368744177664$

$1 \times 2^{47} = 140737488355328$

$1 \times 2^{48} = 281474976710656$

$1 \times 2^{49} = 562949953421312$

$1 \times 2^{50} = 1125899906842624$

$1 \times 2^{51} = 2251799813685248$

$1 \times 2^{52} = 4503599627370496$

$1 \times 2^{53} = 9007199254740992$

$1 \times 2^{54} = 18014398509481984$

$1 \times 2^{55} = 36028797018963968$

$1 \times 2^{56} = 72057594037927936$

$1 \times 2^{57} = 144115188075855872$

$1 \times 2^{58} = 288230376151711744$

$1 \times 2^{59} = 576460752303423488$

$1 \times 2^{60} = 1152921504606846976$

$1 \times 2^{61} = 2305843009213693952$

$1 \times 2^{62} = 4611686018427387904$

$1 \times 2^{63} = 9223372036854775808$

$1 \times 2^{64} = 18446744073709551616$

$1 \times 2^{65} = 36893488147419103232$

$1 \times 2^{66} = 73786976294838206464$

$1 \times 2^{67} = 147573952589676412928$

$1 \times 2^{68} = 295147905179352825856$

$1 \times 2^{69} = 590295810358705651712$

$1 \times 2^{70} = 118059162071711320344$

$1 \times 2^{71} = 236118324143422640688$

$1 \times 2^{72} = 472236648286845281376$

$1 \times 2^{73} = 944473296573690562752$

$1 \times 2^{74} = 1888946593147381125408$

$1 \times 2^{75} = 3777893186294762250816$

$1 \times 2^{76} = 7555786372589524501632$

$1 \times 2^{77} = 1511157274517904903264$

$1 \times 2^{78} = 3022314549035809806528$

$1 \times 2^{79} = 6044629098071619613056$

$1 \times 2^{80} = 12089258196143239226112$

$1 \times 2^{81} = 24178516392286478452224$

$1 \times 2^{82} = 48357032784572956854448$

$1 \times 2^{83} = 96714065569145913708896$

$1 \times 2^{84} = 193428131138291827417792$

$1 \times 2^{85} = 386856262276583654835584$

$1 \times 2^{86} = 773712524553167309671168$

$1 \times 2^{87} = 1547425049106334619342336$

$1 \times 2^{88} = 3094850098212669238684672$

$1 \times 2^{89} = 6189700196425338477369344$

$1 \times 2^{90} = 1237940039285067695473888$

$1 \times 2^{91} = 2475880078570135390947776$

$1 \times 2^{92} = 4951760157140270781895552$

$1 \times 2^{93} = 9903520314280541563791104$

$1 \times 2^{94} = 19807040628561083127582208$

$1 \times 2^{95} = 39614081257122166255164416$

$1 \times 2^{96} = 79228162514244332510328832$

$1 \times 2^{97} = 158456325284486650220657664$

$1 \times 2^{98} = 316912650568973300441315328$

$1 \times 2^{99} = 633825301137946600882630656$

$1 \times 2^{100} = 1267650602275893201765261312$

(2) $(413 \cdot 86)_{10} \rightarrow \text{Binary}$

$413 \times 2 = 826$

$826 \times 2 = 1652$

$1652 \times 2 = 3304$

$3304 \times 2 = 6608$

$6608 \times 2 = 13216$

$13216 \times 2 = 26432$

$26432 \times 2 = 52864$

$52864 \times 2 = 105728$

$105728 \times 2 = 211456$

$211456 \times 2 = 422912$

$422912 \times 2 = 845824$

$845824 \times 2 = 1691648$

$1691648 \times 2 = 3383296$

$3383296 \times 2 = 6766592$

$6766592 \times 2 = 13533184$

$13533184 \times 2 = 27066368$

$27066368 \times 2 = 54132736$

$54132736 \times 2 = 108265472$

$108265472 \times 2 = 216530944$

$216530944 \times 2 = 433061888$

$433061888 \times 2 = 866123776$

$866123776 \times 2 = 1732247552$

$1732247552 \times 2 = 3464495104$

$3464495104 \times 2 = 6928980208$

$6928980208 \times 2 = 13857960416$

$13857960416 \times 2 = 27715920832$

$27715920832 \times 2 = 55431841664$

$55431841664 \times 2 = 110863683328$

$110863683328 \times 2 = 221727366656$

$221727366656 \times 2 = 443454733312$

$443454733312 \times 2 = 886909466624$

$886909466624 \times 2 = 1773818933248$

$1773818933248 \times 2 = 3547637866496$

$3547637866496 \times 2 = 7095275732992$

$7095275732992 \times 2 = 14190551465984$

$14190551465984 \times 2 = 28381102931968$

$28381102931968 \times 2 = 56762205863936$

$56762205863936 \times 2 = 113524411727872$

$113524411727872 \times 2 = 227048823455744$

$227048823455744 \times 2 = 454097646911488$

$454097646911488 \times 2 = 908195293822976$

$908195293822976 \times 2 = 1816390587645952$

$1816390587645952 \times 2 = 3632781175291904$

$3632781175291904 \times 2 = 7265562350583808$

$7265562350583808 \times 2 = 14531124701167616$

$14531124701167616 \times 2 = 29062249402335232$

$29062249402335232 \times 2 = 58124498804670464$

$58124498804670464 \times 2 = 116248997609340928$

$116248997609340928 \times 2 = 232497995218681856$

$232497995218681856 \times 2 = 464995990437363712$

$464995990437363712 \times 2 = 929991980874727424$

$929991980874727424 \times 2 = 1859983961749454848$

$1859983961749454848 \times 2 = 3719967923498909696$

$3719967923498909696 \times 2 = 7439935846997819392$

$7439935846997819392 \times 2 = 14879871693995638784$

$14879871693995638784 \times 2 = 29759743387991277568$

$29759743387991277568 \times 2 = 59519486775982555136$

$59519486775982555136 \times 2 = 119038973551965110272$

$119038973551965110272 \times 2 = 238077947103930220544$

$238077947103930220544 \times 2 = 476155894207860441088$

$476155894207860441088 \times 2 = 952311788415720882176$

$952311788415720882176 \times 2 = 1904623576831441764352$

$1904623576831441764352 \times 2 = 3809247153662883528704$

$3809247153662883528704 \times 2 = 7618494307325767057408$

$7618494307325767057408 \times 2 = 15236988614651534114816$

$15236988614651534114816 \times 2 = 30473977229303068229632$

$30473977229303068229632 \times 2 = 60947954458606136459264$

$60947954458606136459264 \times 2 = 121895908917212272918528$

$121895908917212272918528 \times 2 = 243791817834424545837056$

$243791817834424545837056 \times 2 = 487583635668849091674112$

$487583635668849091674112 \times 2 = 975167271337698183348224$

$975167271337698183348224 \times 2 = 1950334542675396366696448$

$1950334542675396366696448 \times 2 = 3900669085350792733392896$

$3900669085350792733392896 \times 2 = 7801338170701585466785792$

$7801338170701585466785792 \times 2 = 15602676341403170933571584$

$15602676341403170933571584 \times 2 = 31205352682806341867143168$

$31205352682806341867143168 \times 2 = 62410705365612683734286336$

$62410705365612683734286336 \times 2 = 124821410731225367468572672$

$124821410731225367468572672 \times 2 = 249642821462450734937145344$

$249642821462450734937145344 \times 2 = 499285642924901469874290688$

$499285642924901469874290688 \times 2 = 998571285849802939748581376$

$998571285849802939748581376 \times 2 = 1997142571699605879497162752$

$1997142571699605879497162752 \times 2 = 3994285143399211758994325504$

$3994285143399211758994325504 \times 2 = 7988570286798423517988651108$

$7988570286798423517988651108 \times 2 = 15977140573596847035977302216$

$15977140573596847035977302216 \times 2 = 31954281147193694071954604432$

$31954281147193694071954604432 \times 2 = 63908562294387388143909208864$

$63908562294387388143909208864 \times 2 = 127817124588774776287818417728$

$127817124588774776287818417728 \times 2 = 255634249177549552575636835456$

$255634249177549552575636835456 \times 2 = 511268498355099105151273670912$

$511268498355099105151273670912 \times 2 = 1022536996710198210302547341824$

$1022536996710198210302547341824 \times 2 = 2045073993420396420605094683648$

$2045073993420396420605094683648 \times 2 = 4090147986840792841210189367296$

$4090147986840792841210189367296 \times 2 = 8180295973681585682420378734592$

$8180295973681585682420378734592 \times 2 = 16360591947363171364840757469184$

$16360591947363171364840757469184 \times 2 = 32721183894726342729681514938368$

$32721183894726342729681514938368 \times 2 = 65442367789452685459363029876736$

$65442367789452685459363029876736 \times 2 = 130884735578905370918726059753472$

$130884735578905370918726059753472 \times 2 = 261769471157810741837452119506944$

$261769471157810741837452119506944 \times 2 = 523538942315621483674904239013888$

$523538942315621483674904239013888 \times 2 = 1047077884631242967349808478027776$

$1047077884631242967349808478027776 \times 2 = 2094155769262485934699616956055552$

$2094155769262485934699616956055552 \times 2 = 4188311538524971869399233912111088$

$4188311538524971869399233912111088 \times 2 = 8376623077049943738798467824222176$

$8376623077049943738798467824222176 \times 2 = 16753246154099887477596935648444352$

$16753246154099887477596935648444352 \times 2 = 33506492308199774955193871296888704$

$33506492308199774955193871296888704 \times 2 = 67012984616399554910387742593774168$

$67012984616399554910387742593774168 \times 2 = 134025969232799109820775485187548336$

$134025969232799109820775485187548336 \times 2 = 268051938465598219641550970375096672$

$268051938465598219641550970375096672 \times 2 = 536103876931196439283101940750193344$

$536103876931196439283101940750193344 \times 2 = 1072207753862392878566203881500386688$

$1072207753862392878566203881500386688 \times 2 = 2144415507724785757132407763000773376$

$2144415507724785757132407763000773376 \times 2 = 4288831015449571514264815526001546752$

$4288831015449571514264815526001546752 \times 2 = 8577662030899143028529631052003093504$

$8577662030899143028529631052003093504 \times 2 = 17155324061798286057059262104006187008$

$17155324061798286057059262104006187008 \times 2 = 34310648123596572114118524208012374016$

$34310648123596572114118524208012374016 \times 2 = 68621296247193144228237048416024748032$

$68621296247193144228237048416024748032 \times 2 = 137242592494386288456474096832049496064$

$137242592494386288456474096832049496064 \times 2 = 274485184988772576912948193664098992128$

$274485184988772576912948193664098992128 \times 2 = 548970369977545153825896387328197984256$

$548970369977545153825896387328197984256 \times 2 = 1097940739955090307651792774656395968512$

$1097940739955090307651792774656395968512 \times 2 = 2195881479910180615303585549312791937024$

$2195881479910180615303585549312791937024 \times 2 = 4391762959820361230607171098625583874048$

$4391762959820361230607171098625583874048 \times 2 = 8783525919640722461214342197251167748096$

$8783525919640722461214342197251167748096 \times 2 = 17567051839281444924428684394502355481932$

$17567051839281444924428684394502355481932 \times 2 = 35134103678562889848857368789$

Date.....

(16) (2ED)₁₆ = (?)₈ = (?)₂

(21413)₁₆

$$\begin{array}{r} 16 \mid 21413 & | 5 \\ \cancel{16} \mid \cancel{21413} & \cancel{| 5} \\ \hline 16 \mid 1338 & | 10 \\ \cancel{16} \mid \cancel{1338} & \cancel{| 10} \\ \hline 16 \mid 83 & | 3 \\ \cancel{16} \mid \cancel{83} & \cancel{| 3} \\ \hline 1 & | 5. \\ \hline \end{array} = (53A5)_8$$

$$\begin{array}{r} 2 \mid 21413 & | 1 \\ \cancel{2} \mid \cancel{21413} & \cancel{| 1} \\ \hline \cancel{2} \mid \cancel{10760} & | 0 \\ \cancel{2} \mid \cancel{5380} & \cancel{| 0} \\ \cancel{2} \mid \cancel{2690} & \cancel{| 0} \\ \cancel{2} \mid \cancel{1345} & \cancel{| 1} \\ \cancel{2} \mid \cancel{672} & \cancel{| 1} \\ \cancel{2} \mid \cancel{336} & \cancel{| 0} \\ \cancel{2} \mid \cancel{168} & \cancel{| 0} \\ \cancel{2} \mid \cancel{84} & \cancel{| 0} \\ \cancel{2} \mid \cancel{42} & \cancel{| 0} \\ \cancel{2} \mid \cancel{21} & \cancel{| 0} \\ \cancel{2} \mid \cancel{10} & \cancel{| 0} \\ \cancel{2} \mid \cancel{5} & \cancel{| 0} \\ \cancel{2} \mid \cancel{2} & \cancel{| 0} \\ \cancel{2} \mid \cancel{1} & \cancel{| 0} \\ \hline \end{array}$$

$$11001010000110001_2$$

Axx

Spiral

$$\textcircled{b} \quad (250.5)_{10} = (?)_8 = (?)_2$$

Date.....

$$\begin{array}{r} 8 | 200 | 2 \\ \hline 25 | 1 | 7 \\ \hline 3 | 1 | 2 \end{array}$$

$$0.5 \times 8 = 4.0$$

$$(372.4)_8 \text{ Ans}$$

$$\begin{array}{r} 4 | 200 | 02 \\ \hline 0 | 2 | 2 | 2 | 2 \\ \hline 0 | 1 | 5 | 2 \\ \hline 3 | \end{array}$$

$$0.5 \times 2 = 1.0$$

$$(2222.2)_4 \text{ Ans}$$

$$\textcircled{c} \quad (38)_9 = (?)_5 = (?)_2$$

$$\begin{array}{r} 5 | 38 | 8 \\ \hline 8 | 4 | 2 \\ \hline 1 | 1 \end{array}$$

$$\begin{array}{r} 2 | 38 | 0 \\ \hline 19 | 1 | 1 \\ \hline 5 | 9 | 1 \\ \hline 2 | 4 | 0 \\ \hline 2 | 2 | 0 \end{array}$$

$$\textcircled{d} \quad (516)_7 = (?)_2 = (100110)_2$$

$$\begin{array}{r} 16 | 516 | 34 \\ \hline 32 | 3 | 0 \\ \hline 2 | \end{array}$$

$$5x^2 + 1x^1 + 6x^0$$

$$= 245 + 7 + 6 = 258$$

$$= (204)_{16} \text{ Ans}$$

Spiral

Teacher's Sign.....

11) $(3452)_{10}$

⑤ BCD

$\begin{array}{r} 2 | 3452 \\ \hline 2 | 1726 \end{array}$

$\begin{array}{r} 2 | 1726 \\ \hline 2 | 863 \end{array}$

$\begin{array}{r} 2 | 863 \\ \hline 2 | 431 \end{array}$

$\begin{array}{r} 2 | 431 \\ \hline 2 | 215 \end{array}$

$\begin{array}{r} 2 | 215 \\ \hline 2 | 17 \end{array}$

$\begin{array}{r} 2 | 17 \\ \hline 2 | 8 \end{array}$

$\begin{array}{r} 2 | 8 \\ \hline 2 | 4 \end{array}$

$\begin{array}{r} 2 | 4 \\ \hline 2 | 2 \end{array}$

$(100011100)_2 =$

1100

⑦

Excess 3

$(3452)_{10}$

8421

$225 + 345 + 2 + 1$

$+ 3 + 3 + 3$

$\hline 6785$

0110 0111000 0101

Spiral Student

→ Excess Teacher's Sign

D₆

$$(12) \quad H.f = \overline{Hg} = T + \overline{g}$$

$$y = \frac{dy}{dx} = f_y$$

1

$$1 \times 12 + 8$$

(163.789) 1

$$\begin{array}{r}
 0.789 \times 8 = 6.312 \\
 0.312 \times 8 = 2.496 \\
 \hline
 0.968 \times 8 = 0.968
 \end{array}$$

$$16 \times 16.3 / 2 = 130.4$$

$$\begin{array}{r}
 X = 1010101 \\
 y = 1001011 \\
 \hline
 & 1001011 \\
 - & 1010101 \\
 \hline
 & 001110 \\
 + & 0110101 \\
 \hline
 & 111100
 \end{array}$$

Special Agent

Teacher's Sign.....

Shrawanwaje
Ansari

Date.....

(17) $a = (111001)_2$ $b = (101011)_2$

$$\begin{array}{r} 111001 \\ + 101011 \\ \hline 111000 \end{array}$$

$$\begin{array}{r} 101011 \\ - 010100 \\ \hline 010011 \end{array}$$

$$\begin{array}{r} 101011 \\ + 010010 \\ \hline 111001 \end{array}$$

$$\begin{array}{r} 111001 \\ - 010101 \\ \hline 101100 \end{array}$$

(18) $(103)_2 + (50)_2 = (?)_9$

$$\begin{array}{r} 103_2 \\ + 50_2 \\ \hline 111001_2 \end{array}$$

$$\begin{array}{r} 111001_2 \\ + 110010_2 \\ \hline 1011011_2 \end{array}$$

$$111001_2 = 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$$

$$= 64 + 16 + 8 +$$

$$= (88)_9$$

Spiral

Teacher's Sign

(19) The output of a two input X-NOR gate is shown by : $Y = AB + A'B'$.



$$(135)_6 \times (48)_6$$

$$(20) F = (A+B')(C'D+E)$$

(21)

$$AB + B'C + AC = AB + B'C$$

$$= AB + B'C + AC + ABC + BAC$$

Reorganize :-

$$AB + B'C + AC$$

$$= AB + B'C + A(B+B')C$$

$$= AB + B'C + ABC + A'B'C$$

$$= AB(1+C) + B'C(1+C)$$

$$= AB + B'C \text{ Q.E.D. prove}$$

$$(b) (AB + C + D)(C' + D)(C' + D + E) = ABC'D$$

$$= \underline{(A + S)} : -$$

$$(AB + C + D)(C' + D)(C' + D + E)$$

$$= [AB + C + D] \{ C' + D)(1 + E) \}$$

$$= (AB + C + D) (C' + D)$$

$$= [AB + C + D] C' + (AB + C + D) D$$

$$= ABC' + C'C + DC' + AB D + CD + DB$$

$$= ABC' + DC' + ABD + CD + DB$$

$$= ABC' + D + ABD + CD + DB$$

$$\Rightarrow ABC' + D + D(1 + AB) + D$$

$$= ABC' + D + D$$

$$(A + B) + (A' + B') = 0$$

$$\Rightarrow (A' \cdot B')(A' \cdot B')$$

$$= (A' \cdot B')(A' \cdot B)$$

$$\text{Spiral } (A' \cdot A)(B' \cdot B)$$

~~0 x 0 = 0~~

Teacher's Sign.....

12:20

morning

12:20 Date _____

→ starting

(25)

$$I = 4572$$

$$B = 2102$$

A - B

$$\begin{array}{r}
 & 3 & 9 & 9 & 9 & : & 8 & 2 & 0 \\
 - & 2 & 1 & 0 & 2 & & & & \\
 \hline
 & 7 & 8 & 9 & 7 & & & & \\
 & + & 1 & & & & & & \\
 \hline
 & 7 & 8 & 9 & 8 & & & & \\
 \end{array}$$

\rightarrow 10's complement

$$4572$$

$$+ 7898$$

$$\underline{\underline{12470}}$$

(2)

$$(211)_2 = (152)_8$$

$$\Rightarrow 2 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 = 1 \times 8^2 + 5 \times 8^1$$

$$= 24 + 2 + 1 = 64 + 40 + 2$$

$$\therefore n^2 + n + 1 = 106$$

$$\therefore n^2 + n - 105 = 0$$

$$\therefore n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Teacher's Sign.....

Spiral 2 student

$$n = -1 \pm \sqrt{1+840}$$

$$n = -1 \pm 29$$

$$n = 27$$

(5) $(198)_{12} + (12121)_3 = (?)_8$

$$(198)_{12} = 1 \times 12^2 + 9 \times 12 + 8 \times 12^0$$

$$= 1 \times 12^2 + 9 \times 12 + 8 \times 12^0$$

$$= 260$$

$$(1221)_3 = 1 \times 3^4 + 2 \times 3^3 + 1 \times 3^2 + 2 \times 3^1$$

$$(198)_{12} + (12121)_3 - (411)_8$$

$$(198)_{12} + (12121)_3 - (411)_8$$

$$= 260 - 201 - 411$$

$$= 260 - 201 - 411 = 48$$

Spiral