



MaaRula Entrance Classes

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ORIGINAL PAPAER

AMU #2013

- The number of solutions of the equation $z^2 + |z|^2 = 0$, where $z \in \mathbb{C}$ is :
(a) 1 (b) 2 (c) 3 (d) Infinitely many
- If $1, w, w^2$ are the three cube roots of unity then for $\alpha, \beta, \gamma, \delta \in \mathbb{R}$, the expression $\frac{(\alpha + \beta w + \gamma w^2 + \delta w^3)}{(\beta + \alpha w^2 + \gamma w + \delta w)}$ is equal to :
(a) 1 (b) w (c) $-w$ (d) w^{-1}
- If $|z| = \max\{|z-1|, |z+1|\}$, then :
(a) $|z + \bar{z}| = \frac{1}{2}$ (b) $|z - \bar{z}| = 1$
(c) $|z + \bar{z}| = 1$ (d) $z - \bar{z} = 5$
- If α, β are the roots of the equation $8x^2 - 3x + 27 = 0$, then the value of $\left(\frac{\alpha^2}{\beta}\right)^{1/3} + \left(\frac{\beta^2}{\alpha}\right)^{1/3}$ is :
(a) 1/3 (b) 1/4 (c) 1/5 (d) 1/6
- If the value of determinant $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix}$ is positive, then :
(a) $abc > 1$ (b) $abc > -8$ (c) $abc < -\infty$ (d) $abc > -2$
- Let $A_\alpha = \begin{vmatrix} \cos \alpha & -\sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{vmatrix}$, then :
(a) $A_{\alpha+\beta} = A_\alpha A_\beta$ (b) $A_\alpha^{-1} = A_\alpha + A_\beta$
(c) $A_\alpha^{-1} = -A_\alpha$ (d) $A_\alpha^2 = I$
- If A and B are square matrices of the same order such that $A^2 = A, B^2 = B, AB = BA = 0$, then :
(a) $(A+B)^2 = A+B$ (b) $AB^2 \neq 0$
(c) $(A-B)^2 = A-B$ (d) None of these
- The value of $\lim_{x \rightarrow 0} \frac{a^x - b^x}{x}$ is :
(a) $\log(a+b)$ (b) $\log(a-b)$
(c) $\log(ab)$ (d) $\log\left(\frac{a}{b}\right)$
- If $\sin u = \frac{x^2+y^2}{x+y}$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is :
(a) $3 \tan u$ (b) $3 \sin u$ (c) $3 \cos u$ (d) $3 \sec u$
- Which is correct ?
(a) $I(n+1) = n!$ (b) $I(n+1) = nI(n)$
(c) Both are true (d) None are true
- Area of loop of curve $x = a \sin 2t, y = a \sin t$ is :
(a) $4a^2/3$ (b) $2a/3$ (c) $4a^2/5$ (d) $4a/5$
- $\int_{y=0}^2 \int_{x=0}^2 (x^2 + y^2) dx dy =$
(a) $30/7$ (b) $15/7$ (c) $32/3$ (d) $31/3$
- If $u = \log\left(\frac{x^2+y^2}{xy}\right)$, then $\frac{\partial^2 u}{\partial x \partial y}$ is equal to :
(a) $\frac{x(2y)}{(x^2+y^2)^2}$ (b) $\frac{-3x(3y)}{(x^2+y^2)^2}$ (c) $\frac{-2x(2y)}{(x^2+y^2)^2}$ (d) $\frac{3x(3y)}{(x^2+y^2)^2}$
- If $u = \sin^{-1}\left(\frac{x^2+y^2}{(x+y)}\right)$ then the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ equals :
(a) $\tan u$ (b) $\tan^2 u$ (c) $\cot u$ (d) $\cot^2 u$
- If $x + y^3 + u^3 + v^3 = 0$ and $x^3 + y - u^4 + v^4 = 0$ then $\frac{\partial u}{\partial x}$ equals :
(a) $\frac{9x^2-4u}{12u^2(v+u)}$ (b) $\frac{9y^2-2u}{14u^2(v+u)}$
(c) $\frac{9y^2-4v^2}{10u^2(v-u)}$ (d) $\frac{9x^2-8v}{10u^2(v-u)}$
- The value of $\left(\frac{1-\cos^3 x}{x \sin x \cos x}\right)$ when $x \rightarrow 0$ is equal to
(a) 2/5 (b) 3/5 (c) 3/2 (d) 3/4
- Let α and β be the roots of $ax^2 + bx + c = 0$, then $\lim_{x \rightarrow \alpha} \frac{1 - \cos(ax^2 + bx + c)}{(x-\alpha)^2}$ is :
(a) 0 (b) $\frac{1}{2}(\alpha - \beta)^2$ (c) $\frac{a^2}{2}(\alpha - \beta)^2$ (d) $-\frac{a^2}{2}(\alpha - \beta)^2$
- If $f(x)$ is continuous at $x = 0$ and $f(0) = 2$, then $\lim_{x \rightarrow 0} \frac{\int_0^x f(t) dt}{x}$ is equal to :
(a) 0 (b) 2 (c) $f(2)$ (d) 1
- In a plane triangle ABC, the maximum value of $\cos A \cos B \cos C$ is :
(a) 1/8 (b) 1/7 (c) 1/6 (d) 1/5
- The volume of the cylinder $x^2 + y^2 - ax = 0$ bounded by the planes $z = 0$ and $z = x$ is equal to:
(a) 7/6 (b) 7/3 (c) 8/3 (d) 8/5
- The volume of the cylinder $x^2 + y^2 - ax = 0$ bounded by the planes $z = 0$ and $z = x$ is equal to :
(a) $\frac{\pi a^3}{64}$ (b) $\frac{\pi a^2}{32}$ (c) $\frac{\pi a^2}{16}$ (d) $\frac{\pi a^2}{8}$
- The value of $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$ is equal to :
(a) $\frac{1}{8}(e^{4a} - 6e^{3a} + 8e^{2a} - 3)$ (b) $\frac{1}{8}(e^{3a} - 6e^{2a} + 4e^a - 2)$
(c) $\frac{1}{4}(e^{2a} - 6e^a + 2e^a - 1)$ (d) $\frac{1}{2}(e^{2a} - 4e^{2a} + 2e^a)$
- If $\vec{F} = (2xy + z^3)\hat{i} + x^2\hat{j} + 3z^2x\hat{k}$, then the work done in moving the particle from $(1, -2, 1)$ to $(3, 1, 4)$ equals :
(a) 202 (b) 204 (c) 206 (d) 208
- If $\vec{F} = (x^2 - y^2 + x)\hat{i} - (2xy + y)\hat{j}$ the value of $\int \vec{F} \cdot d\vec{r}$ from $(1, 2)$ to $(2, 1)$ equals :
(a) $-(35/6)$ (b) $-(35/8)$ (c) $-(35/11)$ (d) $-(35/13)$
- Expansion of $e^x \sin y$ in powers of x and y as far as term of 2^{nd} degree is :
(a) $y + xy + \dots$ (b) $y - 2xy + \dots$
(c) $y + x^2y^2 + \dots$ (d) $y - 2x^2y + \dots$
- If $x = \gamma \cos \theta, y = \gamma \sin \theta$, then $\frac{\partial(\gamma \theta)}{\partial(x, y)}$ equals :
(a) $1/\gamma$ (b) $1/\gamma^2$ (c) $-1/\gamma$ (d) $-1/\gamma^2$
- If $y = \int_0^x f(t) \sin\{k(x-t)\} dt$ then $\frac{d^2y}{dx^2} + k^2y$ equals :
(a) 0 (b) y (c) $k f(x)$ (d) $k^2 f(x)$
- If the lines $ax + by + c = 0, bx + cy + a = 0$ and $cx + ay + b = 0$ are concurrent ($a + b + c \neq 0$)
(a) $a^3 + b^3 + c^3 - 3abc = 0$
(b) $a = b + 1$
(c) $a = b = c + 9$
(d) $a^2 + b^2 + c^2 - bc - 7ca - 6ab = 0$
- The two circles $c^2 + y^2 + ax = 0$ and $x^2 + y^2 = c^2$ touch each other, if :
(a) $a + c = 0$ (b) $xa - c = 0$
(c) $xa^2 = c^2 + y^2$ (d) none of these
- Equation of the circle having diameters $x - 2y + 3 = 0, 4x - 3y + 2 = 0$ and radius equal to 1, is :
(a) $(x-3)^2 + (y-2)^2 = 1$ (b) $(x-2)^2 + (y-1)^2 = 1$
(c) $x^2 + y^2 - 2x - 4y + 4 = 0$ (d) $x^2 + y^2 - 3x - 4y + 7 = 0$
- If e and e^1 be the eccentricities of a hyperbola and its conjugate, then $\frac{1}{e^2} + \frac{1}{e^{12}}$ is equal to :
(a) 0 (b) 1 (c) 2 (d) None of these
- The general solution of the equation $2 \cos 2x + 1 = 3.2^{-\sin 2x}$ is :
(a) $n\pi, n \in I$ (b) $n\pi + \pi, n \in I$
(c) $n\pi - \pi, n \in I$ (d) None of these
- If $1 + \sin \theta + \sin^2 \theta + \dots = 4 + 2\sqrt{3}, 0 < \theta < \pi, \theta \neq \frac{\pi}{2}$, then :
(a) $\theta = \frac{\pi}{6}$ (b) $\theta = \frac{2\pi}{6}$
(c) $\theta = \frac{\pi}{3}$ or $\frac{\pi}{6}$ (d) $\theta = \frac{\pi}{3}$ or $\frac{2\pi}{3}$
- A Pie-diagram represents the component of a total as :
(a) percentages (b) angles
(c) sectors (d) circles
- The arithmetic mean of two numbers is 25 and the geometric mean is 7. The number are :
(a) 7, 7 (b) 49, 1 (c) 15, 35 (d) none of the above
- An additional observation 15 is included in a series of 11 observations and its mean remains unaffected. The mean of the series was :
(a) 11 (b) 15 (c) 165 (d) 4
- Which of the following would be an appropriate average for determining the average size of readymade garments :
(a) Arithmetic mean (b) Median
(c) Mode (d) Geometric mean
- The mean and variance of a binomial distribution are 8 and 4 respectively. $P(X=1)$ is equal to :
(a) $1/2^{12}$ (b) $1/2^4$ (c) $1/2^6$ (d) $1/4^8$
- A box contain 16 items out of which 4 are defective. A person selects 4 items from the box at random. The expected number of defective items out of his selected items is :
(a) 1 (b) 2 (c) 3 (d) 4
- Probability is expressed as :
(a) ratio (b) proportion (c) percentage (d) all the above
- If A and B are two events, the probability of occurrence of A and B simultaneously is given as :
(a) $P(A) + P(B)$ (b) $P(A \cup B)$
(c) $P(A \cap B)$ (d) $P(A)P(B)$
- The errors in a survey other than sampling errors are called :
(a) formula error (b) planning errors
(c) non-sampling errors (d) none of the above
- If n units are selected in a sample from N units, the sampling fraction is given as :
(a) N/n (b) $1/N$ (c) $1/n$ (d) n/N
- In sample surveys for the estimate $\hat{\theta}$ of a perimeter θ the relation between MSE, Variance and Bias of $\hat{\theta}$ is :
(a) $MSE(\hat{\theta}) = \text{Variance}(\hat{\theta}) - (\text{Bias})^2$
(b) $MSE(\hat{\theta}) = \text{Variance}(\hat{\theta}) + \text{Bias}$
(c) $\text{Variance}(\hat{\theta}) = MSE(\hat{\theta}) - (\text{Bias})^2$
(d) none of the above
- The standard error of the sample mean \bar{y} in simple random sampling without replacement is given by
(a) $\frac{s}{n} \sqrt{\frac{N-n}{N}}$ (b) $\frac{s}{\sqrt{n}} \sqrt{1-f}$
(c) $\frac{s}{\sqrt{n}} \sqrt{1-f}$ (d) None of the above
- Replication in an experiment mean :
(a) the number of blocks
(b) total number of treatments
(c) the number of times a treatment occurs in an experiment
(d) none of the above
- In a completely randomized design with t treatments and n experimental units, error degrees of freedom is equal to :
(a) $n - t$ (b) $n - t - 1$ (c) $n - t + 1$ (d) $t - n$
- The layout
A B C D
A C B D
B A C C
A A B C



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- meet the requirements of a
- (a) completely randomized design
 - (b) randomized block design
 - (c) Latin square design
 - (d) none of the above
49. If X and Y are two random variables, then :
 - (a) $E(XY)^2 = E(X^2)E(Y^2)$
 - (b) $E(XY)^2 = E(X^2Y^2)$
 - (c) $E(XY)^2 \geq E(X^2)E(Y^2)$
 - (d) $E(XY)^2 \leq E(X^2)E(Y^2)$
 50. *Let X and Y be random variables such that $E(Y) = \mu$ and $V(Y) = \sigma^2 > 0$. Let $E(Y|X = x) = \phi(x)$. Then $E[\phi(x)] = \mu$ and $V[\phi(x)] \leq V(Y)$. The above statement is known as :
 - (a) Cramer - Rao Theorem
 - (b) Rao - Blackwell Theorem
 - (c) Hazoor Bazar Theorem
 - (d) none of the above
 51. If H is Hamiltonian of a conservative system then
 - (a) H is not constant of motion
 - (b) H does not represent the total energy of the system
 - (c) $\frac{dH}{dt} \neq 0$
 - (d) $\frac{dH}{dt} = 0$
 52. The zero-point of a harmonic oscillator is E_0 . As the temperature approaches 0 K, the energy E of the oscillator in equilibrium with surroundings would approach :
 - (a) $E = 0$
 - (b) $E = \frac{1}{2}E_0$
 - (c) $E = E_0$
 - (d) $E = 2E_0$
 53. The resolving power of a 2 inch grating having 15000 lines per inch in the second order spectrum is :
 - (a) 15,000
 - (b) 30,000
 - (c) 45,000
 - (d) 60,000
 54. In a successive radioactive decay situation, if the decay constants of parent and daughter nuclides are τ_1 and τ_2 respectively, the activity of daughter is greater than that of the parent by a factor :
 - (a) $\frac{\tau_1}{\tau_2 - \tau_1}$
 - (b) $\frac{(\tau_2 - \tau_1)}{\tau_2}$
 - (c) $\frac{(\tau_2 - \tau_1)}{\tau_1}$
 - (d) $\frac{\tau_1}{(\tau_2 - \tau_1)}$
 55. The principle of equipartition of energy is not valid for :
 - (a) gravitational potential energy
 - (b) translational kinetic energy
 - (c) energy of harmonic oscillator for a given displacement
 - (d) both (b) and (c) above
 56. A monoatomic gas is allowed to expand adiabatically and its volume becomes eight times greater. As compared to the original pressure, the new pressure must be smaller by a factor of :
 - (a) 4
 - (b) 8
 - (c) 12
 - (d) 32
 57. An object, which is initially at rest starts moving in a straight line with an acceleration $a = (15t + 6)m/sec^2$, related to time t, as given. The distance covered by the object in 4 seconds will be :
 - (a) 90 meter
 - (b) 198 meter
 - (c) 208 meter
 - (d) 200 meter
 58. The coefficient of performance of a Carnot refrigerator working between ice point and room temperature 30°C, is approximately equal to :
 - (a) 3
 - (b) 9
 - (c) 2
 - (d) 6
 59. Gauss's law can be used to calculate if :
 - (a) the symmetry of the charge distribution is high
 - (b) the symmetry of the charge distribution is low
 - (c) the Gaussian surface should be an open surface
 - (d) none of these
 60. In free space, Poisson's equation is :
 - (a) $\Delta^2 V = \rho/\epsilon_0$
 - (b) $\Delta^2 V = -\rho/\epsilon_0$
 - (c) $\Delta^2 V = 0$
 - (d) none of the above
 61. For steady state, continuity equation is :
 - (a) $\Delta \cdot \vec{j} = 0$
 - (b) $\Delta \cdot \vec{j} = -\frac{\partial \rho}{\partial t}$
 - (c) $\Delta \cdot \vec{j} = -\frac{\partial \rho}{\partial t}$
 - (d) None of these
 62. A coil does not consume any power. It should be :
 - (a) Resistive
 - (b) Inductive
 - (c) Capacitive
 - (d) none of these
 63. Coupling coefficient denotes :
 - (a) the degree of magnetic leakage
 - (b) Whether the reluctance remains constant
 - (c) The variation of inductance between two coils
 - (d) whether the flux linkage is constant
 64. The coil has an inductance of 5 henry and resistance of 20Ω. If a 100 volts emf is applied, the energy stored in the magnetic field after the current has built up to its maximum value is :
 - (a) 6.25 Joules
 - (b) 62.5 Joules
 - (c) 12.5 Joules
 - (d) 125 joules
 65. Maxwell's electromagnetic equations are valid under all conditions except one and that is :
 - (a) they do not apply to non-homogeneous media
 - (b) they do not apply to non-isotropic media
 - (c) they do not apply to media which move with respect to system of coordinates
 - (d) they do not apply to non-linear media
 66. For a parallel resonance to occur, we should have :
 - (a) $\sqrt{\frac{1}{LC} - \frac{R^2}{L^2}} > 0$
 - (b) $\sqrt{\frac{1}{LC} - \frac{R^2}{L^2}} < 0$
 - (c) $R^2 > \sqrt{\frac{L}{C}}$
 - (d) None of these
 67. Q-factor of a coil is measure of its :
 - (a) mutual inductance
 - (b) self inductance
 - (c) retentivity
 - (d) selectivity
 68. Increasing circuits resistance R :
 - (a) has no effect on bandwidth
 - (b) increases its bandwidth
 - (c) decreases its bandwidth
 - (d) none of these
 69. The energy stored in a magnetic field is given by
 - (a) $\frac{1}{2} \frac{q^2}{C}$
 - (b) $\frac{1}{2} Li^2$
 - (c) $\frac{1}{2} \epsilon_0 E^2$
 - (d) none of these
 70. One Bohr Magnetron is :
 - (a) $9.1 \times 10^{-19} \text{ coulomb} - m^2$
 - (b) $9.1 \times 10^{-24} \text{ amp} - m^2$
 - (c) $1.9 \times 10^{-31} \text{ amp} - m^2$
 - (d) $1.9 \times 10^{-33} \text{ coulomb} - m^2$
 71. Which of the following is the first integrated logic family?
 - (a) RTL
 - (b) DTL
 - (c) TTL
 - (d) MOS
 72. What is the decimal equivalent of 3 F h ?
 - (a) 63
 - (b) 32
 - (c) 16
 - (d) 127
 73. Which of the following requires a device driver ?
 - (a) Register
 - (b) Cache
 - (c) Main Memory
 - (d) Disk
 74. $(142)_{10} \rightarrow ()_{10}$
 - (a) 90
 - (b) 971
 - (c) 99
 - (d) 107
 75. In fiber optics, the signal source is Waves.
 - (a) light
 - (b) infrared
 - (c) radio
 - (d) very low frequency
 76. The 2's complement of binary number 010111.1100 is :
 - (a) 010111.0011
 - (b) 101000.0101
 - (c) 101010.0011
 - (d) none of above
 77. Relations produced from an E-R model will always be in :
 - (a) 1 NF
 - (b) 2NF
 - (c) 3 NF
 - (d) 4 NF
 78. In E-R diagrams, the term cardinality is a synonym for the term :
 - (a) Attribute
 - (b) Degree
 - (c) Entities
 - (d) Cartesian
 79. FFFF will be last memory location in a memory of size :
 - (a) 1 K
 - (b) 16 K
 - (c) 21 K
 - (d) 64 K
 80. Which of the following commands is used to update access k modification time of file :
 - (a) grep
 - (b) WC
 - (c) Touch
 - (d) Cat
 81. Start and stop bits are used in serial communication for:
 - (a) Error detection
 - (b) Error correction
 - (c) Synchronization
 - (d) Slowing down the communication
 82. Context-free grammar can be recognized by :
 - (a) finite state automata
 - (b) 2-way linear bounded automata
 - (c) push down automata
 - (d) both (b) and (c) above
 83. What is (are) the serious problem(s) of the file management system ?
 - (a) Data redundancy
 - (b) Program dependence
 - (c) Difficult to update
 - (d) All of these
 84. Which of the following is not a protocol ?
 - (a) STDM
 - (b) RARP
 - (c) SMTP
 - (d) CSMA
 85. 2^{50} bytes is equivalent to :
 - (a) 1 tebibyte
 - (b) 1 rubibyte
 - (c) 1 pebibyte
 - (d) 1 yobibyte
 86. A turnkey project includes :
 - (a) Hardware
 - (b) Software
 - (c) Training
 - (d) All of these
 87. Students and courses enrolled, is an example of :
 - (a) one to one relationship
 - (b) one to many relationship
 - (c) many to one relationship
 - (d) many to many relationship
 88. The additive group of integers is a cyclic group generated by
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) None
 89. The variables which can be accessed by all modules in a program are known as :
 - (a) Local variables
 - (b) Internal variables
 - (c) External variables
 - (d) Global variables
 90. An algorithm is made up of 2 modules M1 M2, if order of M1 is f(n) and M2 is g(n), then the order of the algorithm is :
 - (a) max (f(n), g(n))
 - (b) min (f(n), g(n))
 - (c) f(n) + g(n)
 - (d) f(n)*g(n)
 91. A man has some identical boxes. Each box is in the shape of a regular octagon with side 78cm. How many boxes does the man have if the perimeter of all the boxes adds upto 5616cm :
 - (a) 8
 - (b) 9
 - (c) 11
 - (d) 7
 92. The chairman arrived at the interview board room for conducting an interview at 10 minutes to 12.30 hrs. He was earlier by twenty minutes than the other members of the board who arrived late by 30 minutes. At what time were the interviews scheduled ?
 - (a) 12.20
 - (b) 12.10
 - (c) 12.30
 - (d) 12.40
 93. If RAMAN is written as 12325 and DINESH as 675894, how MAHAAN will be written :
 - (a) 325335
 - (b) 324225
 - (c) 334225
 - (d) 324325
 94. Arun drives 10km in front 10km to the right. Then every time turning to his left he drives 5, 15 and 15km respectively. how far is he from starting point.
 - (a) 10km
 - (b) 5km
 - (c) 20km
 - (d) 25km
 95. Replace the question mark by choosing the correct response :

31	17	58	87
68	19	61	56
91	22	70	50
10	142	11	?

 - (a) 3
 - (b) 6
 - (c) 7
 - (d) 18
 96. LXM : 12 × 12 :: UVW : ?
 - (a) 21 × 20
 - (b) 21 × 23
 - (c) 20 × 23
 - (d) 23 × 10
 97. Complete the arrangement by filling the blank : 49, 94, 277, ? , 5503, 33010
 - (a) 1100
 - (b) 1106
 - (c) 1108
 - (d) 1102
 98. In a certain code TARGET is written as 8 then how will OBJECT be written ?
 - (a) 11
 - (b) 14
 - (c) 10
 - (d) 18
 99. Which one of the choice is different from others ?
 - (a) 5, 3
 - (b) 7, 17
 - (c) 21, 15
 - (d) 19, 11
 100. If we write four English letters in a line and next four letters just below the above four and so on, then which given two pairs are vertically opposite to each other :
 - (a) D, I and M, O
 - (b) A, E and J, N
 - (c) F, K and G, J
 - (d) N, O and V, W