101. The area bounded by the circle $x^2 + y^2 = 4$ and the line $x = y\sqrt{3}$ in the first quadrant (in sq units) is
(a) π
(b) $\frac{\pi}{2}$
(c) $\frac{\pi}{3}$
(d) None of these

Correct: c

102. The value of the integral $\int_0^1 \frac{e^{5\log_e x} - e^{4\log_e x}}{e^{\log_e x^3} - e^{\log_e x^2}} dx$ is
(a) $\frac{1}{3}$
(b) 1
(c) $-\frac{1}{3}$
(d) - 1

Correct: a

103. $\int \frac{x^3 dx}{1+x^4}$ equals
(a) $\log\left(x^4 + 1\right) + C$
(b) $\frac{1}{4}\log\left(x^4 + 1\right) + C$
(c) $\frac{1}{2}\log\left(x^4 + 1\right) + C$
(d) None of these

Correct: b

104. The shortest distance between the parabolas
$2y^2 = 2x - 1, 2x^2 = 2y - 1$
(a) $2\sqrt{2}$
(b) $\frac{1}{2\sqrt{2}}$
(c) 4
(d) $\sqrt{\frac{36}{5}}$

Correct: b

105. The integral $\int \sqrt{16 - 9x^2}$ dx equals
(a) $\frac{x}{2}\sqrt{16 - 9x^2} + \frac{8}{3}\sin^{-1}\left(\frac{3x}{4}\right) + c$
(b) $\frac{3x}{2}\sqrt{16 - 9x^2} + 16\sin^{-1}\left(\frac{3x}{4}\right) + c$
(c) $\frac{\pi}{2}\sin^{-1}\left(\frac{3x}{4}\right) + \frac{9x}{2} + C$
(d) None of the above

Correct: a

106. The sum of two numbers is 10. Their product will be maximum when they are
(a) 3,7
(b) 4,6
(c) 5,5
(d) 8,2

Correct: c

107. The maximum value of $\frac{\log x}{x}$ is
(a) 1
(b) 2/e
(c) e
(d) 1/e

Correct: d

108. The function $f(x) = \cos^2 x$ is strictly decreasing on
(a) $\left[0, \frac{\pi}{2}\right]$
(b) $\left[0, \frac{\pi}{2}\right)$
(c) $\left(0, \frac{\pi}{2}\right)$
(d) $\left(0, \frac{\pi}{2}\right]$

Correct: c

109. Consider the following propositions :
p: I take medicine
q: I can sleep
Then, the compound statement-p -9 means
(a) If I do not take medicine, then I cannot sleep
(b) I take medicine if I can sleep
(c) If I do not take medicine, then I can sleep
(d) I take medicine iff I can sleep.

Correct: a

110. If $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is to be square root of the two rowed unit matrix, then α, β and γ should satisfy the relation
(a) $1 + \alpha^2 + \beta\gamma = 0$
(b) $1 - \alpha^2 - \beta\gamma = 0$
(c) $1 - \alpha^2 + \beta y = 0$
(d) $1 + \alpha^2 - \beta\gamma = 0$

Correct: b

111. If A and B are two square matrices such that AB = A and BA = B, then
(a) A and B are idempotent
(b) only A is idempotent
(c) only B is idempotent
(d) None of the above

Correct: a

112. If $A_i (i = 1, 2, \ldots, n)$ are n independent events, with $P(A_i) = 1 - \frac{1}{2^i}$ then the probability that at least one of the n events occurs, is
(a) $\frac{1}{2^{n(n+1)/2}}$
(b) $\frac{1}{2^{(n+1)/2}}$
(c) $1 - \frac{1}{2^{n(n+1)/2}}$
(d) $1 - \frac{1}{2^{(n+1)/2}}$

Correct: c

113. The determinant
$\begin{vmatrix} xp+y & x & y \\ yp+z & y & z \\ 0 & xp+y & yp+z \end{vmatrix}$ = 0 if
(a) x, y, z are in AP
(b) x, y, z are in GP
(c) x, y, z are in HP
(d) xy, yz, zx are in AP

Correct: b

114. Out of (2n + 1) consecutively numbered tickets, three tickets are drawn at random. The probability that the numbers on them are in arithmetic progression is
(a) $\frac{n}{4n^2-1}$
(b) $\frac{n^2}{4n^2-1}$
(c) $\frac{3n}{4n^2-1}$
(d) $\frac{3n^2}{4n^2-1}$

Correct: c

115. A certain item is manufactured by machine M_1 and M_2. It is known that machine M_1 turns out twice as many items as machine M_2. It is also known that 4% of the items produced by machine M_1 and 3% of the items produced by machine M_2 are defective. All the items produced are put into one stock pile and then one item is selected at random. The probability that the selected item is defective is equal to
(a) 10/300
(b) 11/300
(c) 10/200
(d) 11/200

Correct: b

116. If A and B are independent events such that P(B) = P(AUB) = 0.8, then
$P(B) = \frac{2}{7}, P(A \cup \overline{B}) = 0.8, \text{ then } P(A) =$
(a) 0.4
(b) 0.3
(c) 0.2
(d) 0.1

Correct: b

117. If A and B are independent events associated to some experiments E such that $P\left(A^C \cap B\right) = \frac{2}{15}$ and $P\left(A \cap B^C\right) = \frac{1}{6}$, then P(B) is equal to
(a) $\frac{1}{6}, \frac{1}{5}$
(b) $\frac{1}{6}, \frac{4}{5}$
(c) $\frac{4}{5}, \frac{1}{5}$
(d) $\frac{4}{5}, \frac{5}{6}$

Correct: b

118. The value of λ so that the vectors $a = 2\hat{i} - \hat{j} + \hat{k}$, $b = \hat{i} + 2\hat{j} - 3\hat{k}$ and $c = 3\hat{i} + \lambda\hat{j} + 5\hat{k}$ are coplanar is
(a) - 1
(b) -2
(c) - 3
(d) - 4

Correct: d

119. The differential equation of all parabolas whose axis of symmetry is parallel to X-axis is of order
(a) 2
(b) 3
(c) 1
(d) 4

Correct: b

120. If A is an orthogonal matrix, then
(a) $|A| = 0$
(b) $|A| = \pm 1$
(c) $|A| = \pm 2$
(d) $|A| = \pm \frac{1}{2}$

Correct: b

121. The equation $x^2 + y^2 + 4x + 6y + 13 = 0$ represents
(a) a pair of coincident lines
(b) a pair of concurrent straight lines
(c) a parabola
(d) a point circle

Correct: d

122. The two lines $ty = x + t^2$ and $y + tx = 2t + t^3$ intersect at the point lies on the curve whose equation is
(a) $y^2 = 4x$
(b) $y^2 = -4x$
(c) $x^2 = 4x$
(d) $x^2 = -4x$

Correct: a

123. The directrix of the parabola $4y^2 + 12x - 12y + 39 = 0$ is
(a) $x = \frac{3}{4}$
(b) $x = \frac{-7}{4}$
(c) $x = \frac{-5}{2}$
(d) $x = \frac{3}{2}$

Correct: b

124. A line perpendicular to the line segment joining the points (1,0) and (2,3) divides it in the ratio 1:n. The equation of the line is
(a) $3y + x = \frac{n+11}{n+1}$
(b) $3y - x = \frac{n+11}{n+1}$
(c) $3y + x = \frac{n-11}{n+1}$
(d) $3y - x = \frac{n+11}{n-1}$

Correct: a

125. If origin is the centroid of a ΔPQR with vertices P(2a, 2, 6), Q(-4, 3b, -10) and R(8, 14, 2c), then the value of a, b and c are respectively
(a) -2, 2, 2
(b) -2, 2, -16/3
(c) -2, -16/3, 2
(d) -16/3, -2, 2

Correct: c

126. The angle between the lines with direction ratios 4, -3, 5 and 3, 4, 5 is
(a) $\frac{\pi}{3}$

(b) $\frac{\pi}{4}$
(c) $\frac{\pi}{6}$
(d) $\frac{\pi}{2}$

Correct: a

127. Given that the points P(3,2,-4), Q(5, 4, -6) and R(9,8,- 10) are collinear, the ratio in which Q divides PR externally is
(a) 1:2
(b) 2:1
(c) 1:1
(d) 2:2

Correct: a

128. Let A and B be two points with position vectors $\vec{a}$ and $\vec{b}$ respectively and let C be a point dividing AB internally and the position vector of C on AB is $\vec{c} = \lambda\vec{a} + \mu\vec{b}$ then
(a) $\lambda + \mu = 0$
(b) $\lambda + \mu = 1$
(c) $\lambda + \mu < 1$
(d) $\lambda + \mu > 1$

Correct: b

129. The sum of n terms of the series
$1^2 + \left(1^2 + 2^2\right) + \left(1^2 + 2^1 + 3^2\right) + \ldots\ldots\ldots\ldots$.....is
(a) $\frac{n(n+1)(n+2)}{12}$
(b) $\frac{n(n+1)(n+2)^2}{12}$
(c) $\frac{n^2(n+1)(n+2)}{12}$
(d) $\frac{m(n+1)^2(n+2)}{12}$

Correct: d

130. If $x^y = e^{x-y}$, then $\frac{dy}{dx}$ is equal to
(a) $\frac{1}{1+\log x}$
(b) $\frac{1}{(1+\log x)^2}$
(c) $\frac{\log x}{1+\log x}$
(d) $\frac{\log x}{(1+\log x)^2}$

Correct: d

131. If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \frac{dy}{dx}$ equals
(a) 0
(b) 1
(c) -1
(d) None of these

Correct: b

132. If $\lim_{x\to 0} \frac{\log(3+x)-\log(3-x)}{x} = K$, then K is equal to
(a) 2/5
(b) 2/3
(c) 1/2
(d) 5/2

Correct: b

133. If f(x) = $\frac{x}{2} - 1$, then on the interval $[0, \pi]$
(a) tan [f(x)] and 1/f(x) are both continuous
(b) tan [f(x)] and 1/f(x) are both discontinuous
(c) tan [f(x)] is continuous but 1/f(x) is not continuous
(d) tan [f(x)] is not continuous but 1/f(x) is continuous

Correct: c

134. If $y = \tan^{-1}\left(\sqrt{1+x^2} - x\right)$, then $\frac{dy}{dx}$ equals

(a) $\frac{1}{2(1+x^2)}$

(b) $\frac{-1}{(1+x^2)}$

(c) $\frac{-1}{2(1+x^2)}$

(d) $\frac{2}{(1+x^2)}$

Correct: c

135. If y = $\sec\left(\tan^{-1} x\right)$, then $\frac{dy}{dx}$ at x = 1 is

(a) 1/2

(b) $\frac{1}{\sqrt{2}}$

(c) $\sqrt{2}$

(d) 1

Correct: b

136. If $f(x) = x^n \log x$ and f(0) = 0, then the value of α for which Rolle's theorem can be applied in [0, 1] is

(a) -1

(b) 1/2

(c) -1/2

(d) 0

Correct: b

137. An n-tuple (x_1, x_2, x_3,..... x_n) which satisfies all the constraints of a linear programming problem and for which the objective function is maximum (compared to all n-tuples which satisfy all the constraints) is called

(a) a solution

(b) a feasible solution

(c) an optimal solution

(d) an actual solution

Correct: c

138. Given the LPP :

Minimize f = $2x_1 - x_2$

$$x_1 \geq 0, x_2 \geq 0$$
$$x_1 + x_2 \geq 5$$
$$-x_1 + x_2 \leq 1$$
$$5x_1 + 4x_2 \leq 40$$

The solution is

(a) 1

(b) -1

(c) 2

(d) -2

Correct: a

139. If 49^n + 16n + λ is divisible by 64 for all n $\in$ N, then the least negative integral value of λ is

(a) -1

(b) -2

(c) -3

(d) -4

Correct: a

140. If $y = \sqrt{\frac{1-x}{1+x}}$, then $\left(1-x^2\right)\frac{dy}{dx} + y$ is

(a) 1

(b) 0

(c) -1

(d) 2

Correct: b

141. The greatest value of the term independent of x, as α varies over R, in the expansion of $\left(x\cos\alpha+\frac{\sin\alpha}{x}\right)^{10}$

(a) ${}^{10}C_5$

(b) $\left(\frac{1}{2}\right)^5 \cdot {}^{10}C_5$

(c) $\left(\frac{1}{2}\right)^4 ({}^{10}C_5)$

(d) $\left(\frac{1}{2}\right)^3 ({}^{10}C_5)$

Correct: b

142. The value of $\left(\frac{1+i}{1-i}\right)^{100}$ is equal to

(a) 1

(b) -1

(c) i

(d) -i

Correct: a

143. The value of $\sum_{n=1}^{13}\left(i^n+i^{n+1}\right)$, where i = $\sqrt{-1}$ equals

(a) 0

(b) i

(c) -i

(d) i-1

Correct: d

144. An electrician can be paid under two schemes as follows:
I. ₱ 600 and ₱ 50 per hour
II. ₱ 170 per hour
If the job take n hours, for which values of n does the scheme I given the electrician better wages

(a) n > 5

(b) n > 4

(c) n < 5

(d) n < 4

Correct: c

145. If $X=\{4^n-3n-1|n\in N\}$ and
$Y=\{9(n-1)|n\in N\}$, then

(a) $X\subset Y$

(b) $Y\subset X$

(c) X = Y

(d) None of these

Correct: a

146. The value of $\frac{\sin^3 3\theta}{\sin^2\theta}-\frac{\cos^2 3\theta}{\cos^2\theta}$

(a) $8\cos 2\theta$

(b) $3\sin 2\theta$

(c) $\frac{1}{8}\cos 2\theta$

(d) None of these

Correct: a

147. The value of the expression
$1-\frac{\sin^2 y}{1+\cos y}+\frac{1+\cos y}{\sin y}-\frac{\sin y}{1-\cos y}$ to

(a) sin y

(b) cos y

(c) 0

(d) 1

Correct: b

148. The solution set of the equation
$\sin^{-1}x=2\tan^{-1}x$

(a) {1, 2}

(b) {-1, 2)
(c) {-1, 1, 0)
(d) {1, 1/2, 0}

Correct: c

149. A roots of the equation
$17x^2 + 17x \tan\left(2\tan^{-1}\frac{1}{5} - \frac{\pi}{4}\right) - 10 = 0$ is
(a) 10/17
(b) -1
(c) -7/17
(d) 1

Correct: d

150. If $A = \begin{bmatrix} k & 1 \\ m & n \end{bmatrix}$ and k.n lm, then the value of $A^2 - (k+n)A + (kn - lm)I$ equals
(a) The zero matrix of order 2 x 2
(b) A
(c)-A
(d) 2A
where / is the identity matrix of order 2 x 25

Correct: a