ITM (sls) BARODA UNIVERSITY

School of Computer Science Engineering & Technology

Subject: Applied Mathematics-I (T11X0C1)

Semester: 1st (Diploma Engineering)

Unit 1: Trigonometry

Short Questions

1	Convert following angles into radian measure: આપેલ ખૂણા ના માપ નું રેડિઅન માં રુપાંતર કરો a) 40° b) 150° c) 165° d) 210° e) 315°
2	Convert following angles into degree measure: આપેલ ખૂણા ના માપ નું ડિગ્રી માં રુપાંતર કરો a) $\frac{\pi}{18}$ b) $\frac{3\pi}{2}$ c) $\frac{21\pi}{4}$ d) $\frac{14\pi}{3}$ e) $\frac{13\pi}{6}$
3	Find value for: કિમત શોધો : a) tan 150° b) cos 210° c) cosec 330° d) $\sin\frac{5\pi}{4}$ e) $\tan\frac{11\pi}{4}$ f) $\sin\frac{2\pi}{3}$
4	$\sin 150° \cdot \cos 240° \cdot \tan 120° =$ _____
5	tan 1° tan 2° tan 3° ..... tan 88° tan 89° = _____
6	cos 75° = _____
7	tan 105° = _____
8	$\cos 130° \cos 40° + \sin 130° \sin 40° =$ _____
9	$\sin 75° + \sin 15° =$ _____
10	$\sin 50° - \cos 80° =$ _____
11	$\cos\frac{4\pi}{5} + \cos\frac{\pi}{5} =$ _____
12	$2 \sin 75° \sin 15° =$ _____
13	$\sin\frac{5\pi}{12} \sin\frac{\pi}{12} =$ _____

Long Questions	
1	In ΔABC, right angled at B, AB = 24 cm, BC = 7 cm then determine: જો ΔABC માં કાટખૂણો B હોય અને AB = 24 cm, BC = 7 cm , તો નીચે આપેલ કિંમતો શોધો (i) sinA , cosA (ii) sin C, cos C
2	In ΔPQR, $\cos R = \frac{5}{13}$, Then find all other trigonometric ratios for angle R. જો ΔPQR માં $\cos R = \frac{5}{13}$ હોય , તો અન્ય પાંચ ત્રિકોણમિતીય ગુણોતરો શોધો
3	Prove that(સાબિત કરો) $(\text{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\cot\theta + \tan\theta) = 1$
4	Prove that(સાબિત કરો) : $\tan\theta(1-\cot^2\theta) + \cot\theta(1-\tan^2\theta) = 0$
5	Prove that (સાબિત કરો) $\frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta} = \sin\theta + \cos\theta$
6	Evaluate: કિંમત શોધો:$\text{cosec}^2 45° + \tan^2 45° - 3\sin^2 90°$
7	Evaluate: કિંમત શોધો: $\text{cosec}^2\frac{\pi}{4} \cdot \sec^2\frac{\pi}{6} - \sin^2\frac{\pi}{3} - 4\cot^2\frac{\pi}{4} + \sec^2\frac{\pi}{6}$
8	Prove that(સાબિત કરો) $\frac{\sin\left(\theta-\frac{\pi}{2}\right)}{\cos(\theta-\pi)} + \frac{\tan\left(\frac{\pi}{2}-\theta\right)}{\cot(2\pi+\theta)} + \frac{\text{cosec}\left(\frac{3\pi}{2}-\theta\right)}{\sec(\pi-\theta)} = 3$
9	Prove that(સાબિત કરો) $\frac{\sin\left(\frac{\pi}{2}+\theta\right)}{\cos(\pi-\theta)} + \frac{\cot\left(\frac{3\pi}{2}-\theta\right)}{\tan(\pi-\theta)} + \frac{\text{cosec}\left(\frac{\pi}{2}-\theta\right)}{\sec(\pi+\theta)} = -3$
10	Prove that(સાબિત કરો) $\cos\left(\frac{19\pi}{6}\right)\sin\left(\frac{17\pi}{6}\right) - \sin\left(\frac{11\pi}{6}\right)\cos\left(\frac{13\pi}{6}\right) = 0$

11	Prove that(સાબિત કરો) $\cos\left(\frac{3\pi}{19}\right)+\cos\left(\frac{7\pi}{19}\right)+\cos\left(\frac{12\pi}{19}\right)+\cos\left(\frac{16\pi}{19}\right)=0$
12	Prove that(સાબિત કરો) $sin^2\left(\frac{\pi}{18}\right)+sin^2\left(\frac{\pi}{9}\right)+sin^2\left(\frac{7\pi}{18}\right)+sin^2\left(\frac{4\pi}{9}\right)=2$
13	Prove that (સાબિત કરો) $\cos A\cdot\sin(B-C)+\cos B\cdot\sin(C-A)+\cos C\cdot\sin(A-B)=0$
14	Prove that(સાબિત કરો) $\frac{\sin(A-B)}{\cos A\cos B}+\frac{\sin(B-C)}{\cos B\cos C}+\frac{\sin(C-A)}{\cos C\cos A}=0$
15	Prove that(સાબિત કરો) $\tan 57^\circ=\frac{\cos 12^\circ+\sin 12^\circ}{\cos 12^\circ-\sin 12^\circ}$
16	Prove that (સાબિત કરો) $(1+\tan 25^\circ)(1+\tan 20^\circ)=2$
17	Prove that(સાબિત કરો) $\tan 35^\circ+\tan 10^\circ+\tan 35^\circ\tan 10^\circ=1$
18	Prove that (સાબિત કરો) $\frac{\cos A+\cos 3A+\cos 5A}{\sin A+\sin 3A+\sin 5A}=\cot 3A$
19	Prove that(સાબિત કરો) $\frac{\sin 2A+\sin 4A+\sin 6A+\sin 8A}{\cos 2A+\cos 4A+\cos 6A+\cos 8A}=\tan 5A$
20	Prove that(સાબિત કરો) $\cos 20^\circ\cos 40^\circ\cos 60^\circ\cos 80^\circ=\frac{1}{16}$
21	Prove that(સાબિત કરો) $\tan 20^\circ\tan 40^\circ\tan 80^\circ=\tan 60^\circ$
22	Prove that (સાબિત કરો) $\frac{\sin 2\theta}{\sin\theta}-\frac{\cos 2\theta}{\cos\theta}=\sec\theta$
23	Prove that(સાબિત કરો) $\frac{\cot^2\theta-1}{\operatorname{cosec}^2\theta}=\cos 2\theta$

24	If $\tan\frac{\theta}{2} = \frac{3}{2}$; $0 < \theta < \pi$, then find value of $3\sin\theta + 2\cos\theta$ જો $\tan\frac{\theta}{2} = \frac{3}{2}$; $0 < \theta < \pi$હોય તો $3\sin\theta + 2\cos\theta$ની કિંમત શોધો
25	Prove that (સાબિત કરો) $\frac{\sin 3\theta - \sin\theta}{\cos 3\theta + \cos\theta} = \tan\theta$
26	Draw the graph of $y = sinx$; $0 \le x \le \pi$ આલેખ દોરો: $y = sinx$; $0 \le x \le \pi$
27	Draw the graph of $y = 2cosx$; $0 \le x \le \pi$ આલેખ દોરો : $y = 2cosx$; $0 \le x \le \pi$
28	Draw the graph of $y = \sin\frac{x}{2}$; $0 \le x \le 2\pi$ આલેખ દોરો : $y = \sin\frac{x}{2}$; $0 \le x \le 2\pi$

Unit 2: Differential Calculus

Short Questions

1	If $f(x) = 7^x$ then $f(0) =$ _____		
2	If $f(x) = cosx$ then $f\left(\frac{\pi}{2}\right) =$ _____		
3	$\lim_{n\to\infty} \frac{3n^3 - 4n^2 + 5n - 3}{4n^3 + n^2 - 7n + 5} =$ _____	4	$\lim_{x\to 2} \frac{x^4 - 16}{x - 2} =$ _____
5	$\lim_{x\to 0} \left(1 + \frac{2x}{3}\right)^{\frac{7}{x}} =$ _____	6	$\lim_{\theta\to 0} \frac{sin5\theta}{\theta} =$ _____
7	$\lim_{x\to 0} \frac{4^x - 1}{x} =$ _____	8	$\lim_{x\to\infty} (1 + 4x)^{\frac{x}{3}} =$ _____
9	$\frac{d}{dx}(cosecx) =$ _____	10	$\frac{d}{d\theta}(tan\theta) =$ _____
11	$\frac{d}{d\theta}(cos^3\theta) =$ _____	12	$\frac{d}{dx}(e^{3x} + logx) =$ _____
13	If $f(x) = log2x$ then $f'(1) =$ _____		
14	If $f(x) = sinx$ then $f'\left(\frac{\pi}{2}\right) =$ _____		

Long Questions			
1	If $f(x) = \frac{ax+b}{bx+a}$ then prove that (સાબિત કરો) $f(x) \cdot f\left(\frac{1}{x}\right) = 1$		
2	If $f(x) = \frac{1+x}{1-x}$ then prove that (સાબિત કરો) (i) $f(x) + f\left(\frac{1}{x}\right) = 0$ (ii) $f(x) - f\left(\frac{1}{x}\right) = 2f(x)$		
	Solve the following: (ઉકેલો)		
3	$\lim_{x\to 1} \frac{x^2-3x+2}{7x^2-6x-1}$	4	$\lim_{x\to 2} \frac{x^3-2x^2+x-2}{x^2-x-2}$
5	$\lim_{x\to -1} \frac{2x^3+5x^2+4x+1}{3x^3+5x^2+x-1}$	6	$\lim_{x\to 2} \frac{x^3-x^2-x-2}{x^2-6x+8}$
7	$\lim_{x\to 0} \frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{x^2}$	8	$\lim_{x\to 1} \frac{\sqrt{9x+7}-\sqrt{3x+13}}{\sqrt{3x+1}-\sqrt{5x-1}}$
9	$\lim_{n\to\infty} \frac{3n^3+4n^2+3n-3}{4n^4+n^3-7n+5}$	10	$\lim_{x\to 2} \frac{x^6-64}{x^{\frac{1}{3}}-2^{\frac{1}{3}}}$
11	$\lim_{x\to 0} \frac{a^x-b^x}{x}$	12	$\lim_{x\to\infty} \left(\frac{x+4}{x+3}\right)^x$
13	$\lim_{x\to 0} \frac{3xcosx-5sinx}{7x+tanx}$		
14	Find derivative of $y = sinx$ using definition of derivative. $y = sinx$ નું વિકલન ની વ્યાખ્યા ની મદદ થી વિકલન કરો		
15	Find derivative of $y = logx$ using definition of derivative. $y = logx$ નું વિકલન ની વ્યાખ્યા ની મદદ થી વિકલન કરો		
	Differentiate following: (વિકલન કરો)		
16	$\frac{d}{d\theta}(sin2\theta - tan\theta)$	17	$\frac{d}{dx}(4e^{3x} + log3x - 3^x)$

18	$\frac{d}{dx}\left(x+\frac{1}{x}\right)^3$	19	$\frac{d}{dx}\,(logx\ sinx)$
20	$\frac{d}{dx}\left((x^3-3)(x^4+4)\right)$	21	$\frac{d}{dx}\,(\ sin2x\ cos3x)$
22	$\frac{d}{dx}\,(\log(sin2x))$	23	$\frac{d}{dx}\,(\log(x^2+2x+3))$
24	$\frac{d}{dx}\,(\log(secx+tanx))$	25	$\frac{d}{dx}\,(\log(log4x))$
26	$\frac{d}{d\theta}\,(\cos(sin2\theta))$	27	$\frac{d}{dx}\left(\frac{sinx}{logx}\right)$
28	$\frac{d}{dx}\left(\frac{1+sinx}{1-sinx}\right)$	29	$\frac{d}{dx}\left(\frac{\sin(logx)}{x}\right)$

Unit 3: Algebra

Short Questions

1	Write conjugate of following complex numbers: આપેલ સંકર સંખ્યાઓ ના અનુબંધ લખો 1) $3+2i$ 2) $-4+i$ 3) $\sqrt{7}-3i$ 4) $-3-\sqrt{6}i$
2	Simplify: સાદું રૂપ આપો 1) $(3+7i)+(18-5i)$ 2) $(15-6i)-(3-9i)$ 3) $8(6-9i)+i(4+7i)$ 4) $(2+7i)(4-6i)$ 5) $(6+13i)(4+2i)$ 6) $(3+2i)^2$ 7) $(1-i)^3$ 8) $(a+ib)(a-ib)$
3	Find modulus and Amplitude of given complex numbers: આપેલ સંકર સંખ્યાઓ માટે માન અને કોણાંક શોધો 1) $2+3i$ 2) $-3+i$ 3) $\sqrt{3}+i$ 4) $1-2i$
4	Find value: કિંમત શોધો: 1) $^{13}C_7$ 2) $^{10}C_4$ 3) $^{9}C_6+^{9}C_5$

	4) ${}^{12}P_6$ 5) ${}^{14}P_2$ 6) ${}^{10}P_4$
5	Find General term in the expansion of following: નીચે આપેલ ના વિસ્તરણ માં આવતું સામાન્ય પદ શોધો 1) $(2x+1)^5$ 2) $\left(4x-\frac{5}{2x}\right)^9$ 3) $\left(2x^2+\frac{1}{x}\right)^{12}$ 4) $(2x-y)^{11}$
	Long Questions
1	Express following in form of $a+ib$: નીચે આપેલ ને $a+ib$ ના રુપ માં દર્શાવો 1) $\frac{3+6i}{-2-3i}$ 2) $\frac{1-i}{1+i}$ 3) $\frac{(4+5i)(2+i)}{6-5i}$ 4) $\frac{(2+3i)(1+i)}{(2+i)(3-2i)}$ 5) $\frac{4i}{(1+2i)^2}$
2	Convert given complex numbers in polar form: આપેલ સંકર સંખ્યાઓ ને તેના ધ્રુવીય રુપ માં દર્શાવો 1) $6+3i$ 2) $-3+2i$ 3) $\frac{2+6\sqrt{3}i}{5+\sqrt{3}i}$
3	Convert given polar form into complex number: આપેલ ધ્રુવીય રુપ ને સંકર સંખ્યા માં ફેરવો: 1) $\left(4,\frac{\pi}{3}\right)$ 2) $\left(5,\frac{\pi}{2}\right)$ 3) $(2,\pi)$
4	Find modulus and Amplitude of given complex numbers: આપેલ સંકર સંખ્યાઓ માટે માન અને કોણાંક શોધો 1) $\frac{1+2i}{1-3i}$ 2) $\sqrt{\frac{1+i}{1-i}}$
5	Simplify the following: સાદું રુપ આપો : 1) $\frac{(cos\theta+i\,sin\theta)^8}{(cos\theta+i\,sin\theta)^4}$ 2) $\frac{(cos\theta+i\,sin\theta)^5}{(cos\theta-i\,sin\theta)^3}$ 3) $\frac{(cos\theta-i\,sin\theta)^2}{(cos\theta-i\,sin\theta)^4}$

6	Find value of: કિંમત શોધો: 1) $(1+i)^{16}$ 2) $(1+\sqrt{3}i)^{3}$
7)	Express following into **Partial fraction**: નીચે આપેલ ને આંશિક અપૂર્ણાંક માં દર્શાવો: 1) $\frac{7x-25}{(x-3)(x-4)}$ 2) $\frac{2x+3}{(x-2)(x+5)}$ 3) $\frac{1}{x^2-1}$ 4) $\frac{2x+5}{x^2+5x+6}$ 5) $\frac{x^2-3x+1}{(x-1)^2(x-2)}$ 6) $\frac{4+7x}{(2+3x)(1+x)^2}$ 7) $\frac{9x-7}{(x^2+1)(x+3)}$ 8) $\frac{x^2+3x-1}{(x^2+5)(x-2)}$
8)	Using Binomial theorem, Expand the following: બિનોમિઅલ થિઓરેમ ની મદદ થી વિસ્તરણ કરો 1) $(3x+y)^{4}$ 2) $(2x-3y)^{3}$ 3) $(1-x)^{6}$ 4) $(4x+3)^{5}$ 5) $\left(x-\frac{y}{2}\right)^{5}$ 6) $\left(\frac{2}{x}+\frac{x}{2}\right)^{4}$
9)	Evaluate following using Binomial theorem: બિનોમિઅલ થિઓરેમ ની મદદ થી આપેલ નો કિંમત શોધો 1) $\left(2+\sqrt{5}\right)^{7}-\left(2-\sqrt{5}\right)^{7}$ 2) $\left(3+\sqrt{2}\right)^{6}+\left(3-\sqrt{2}\right)^{6}$

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