

Time : 3 Hrs.

D1G
Engg. Math.-I

Full Marks : 80

Pass Marks : 26

*Answer all questions in your own words.**I Hkh ç'uka ds mÜkj vi us 'kCrka eanA**The figures in right hand margin indicate full marks.**i k'oz ds vrd i wkkel ds l pd gA***English Version****1. Answer *all* questions : **1x20=20****

(i) The set of wires through which data or address is transferred from one unit to other unit of a computer system is called

(ii) If ${}^nC_{18} = {}^nC_{12}$, then ${}^{32}C_n = \dots$

(iii) Value of e is :

(a) less than 2 (b) equal to 2

(c) less than 3 (d) greater than 3.

P.T.O.

(iv) The 11th term from the end in the expansion of

$$\left(2x^2 - \frac{1}{x}\right)^{12} \text{ is } \dots\dots\dots .$$

(v) The value of the determinant :

$$\begin{vmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 3 & 7 \\ 6 & 3 & 9 & 15 \\ 1 & 2 & 3 & 4 \end{vmatrix} \text{ is } \dots\dots\dots .$$

(vi) Define unit matrix.

(vii) Modulus of $(1 + 2i)(1 + 3i)(3 + 4i)$ is $\dots\dots\dots$.

(viii) If $\frac{5+xi}{2} = 2\frac{1}{2}$, find the value of x if $i = \sqrt{-1}$.

(ix) In a ΔABC , if $a = 2$, $b = 3$ and $\sin A = \frac{2}{3}$, find $\angle B$.

(x) The minimum value of $\tan^2 q + \cot^2 q$ is $\dots\dots\dots$

(xi) The value of $\sin 105^\circ + \cos 105^\circ$ is $\dots\dots\dots$.

(xii) In a ΔABC , $a = 18$, $b = 24$ and $c = 30$, the value of $\sin A$ is $\dots\dots\dots$.

(xiii) In which quadrant the point $(1, -9)$ lies $\dots\dots\dots$.

(xiv) The cartesian co-ordinate of a point is $(1, 1)$, find its polar co-ordinate.

(xv) The length of perpendicular from origin to the line $x + \sqrt{3}y = 4$ is $\dots\dots\dots$.

(xvi) The direction cosine of the line joining $p(4, 5, 0)$ and $Q(2, 6, 2)$ is $\dots\dots\dots$.

(xvii) If the plane $3x + y + 4z + 2 = 0$ is parallel to the plane $6x + ky + 8z = 5$, the value of k is $\dots\dots\dots$.

(xviii) Equation of line perpendicular to the plane $2x + \sqrt{3}y + 3z = 5$ and passing through $(1, 2, -1)$ is $\dots\dots\dots$.

(xix) The value of $\log_3^2 \times \log_5^3 \times \log_2^5$ is $\dots\dots\dots$.

(xx) Write full form of 'BASIC'.

2. Resolve into partial fraction : 4

$$\frac{4x^2 + 5}{(x-2)(x+1)(2x-3)} \quad \text{OR,} \quad \frac{x^4}{(x-1)^4(x+1)}$$

3. The sum of an infinite geometric series is 15 and the sum of squares of these terms is 45. Find the series. 4

OR,

If the p^{th} , q^{th} and r^{th} term of a Harmonic progression is a , b , c respectively, then prove that

$$bc(q-r) + ca(r-p) + ab(p-q) = 0$$

4. State 'Fundamental principle of counting'. How many numbers are there between 100 and 1000 which have exactly one of their digits as 7. 4

OR,

Define a matrix. What is difference between a matrix and determinant ? Explain with example.

5. If $\cot^2 q + \frac{3}{\sin q} + 3 = 0$, find general value of q . 4

OR,

$$\text{Prove that } 2 \tan^{-1} x = \sin^{-1} \left(\frac{2x}{1-x^2} \right) = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right).$$

6. Find the equation of a circle which touches y-axis at a distance 4 from origin and cuts an intercept of length 6 from x-axis. 4

OR,

Find the equation of a circle whose centre is at (h_1, k) and radius is a .

7. (a) In ΔABC prove that : 4+4=8

$$\tan \frac{B-C}{2} = \frac{b-c}{b+c} \cot \frac{A}{2}$$

- (b) If $A + B + C = p$, prove that

$$\frac{\cot A + \cot B}{\tan A + \tan B} + \frac{\cot B + \cot C}{\tan B + \tan C} + \frac{\cot C + \cot A}{\tan C + \tan A} = 1$$

OR,

- (a) If a^2, b^2, c^2 are in AP, prove that $\cot A, \cot B, \cot C$ are in A.P.

P.T.O.

(b) Prove that $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

8. (a) If z_1 and z_2 are two complex numbers **4+4=8**

such that $|z_1 + z_2| = |z_1 - z_2|$

prove that : $\text{Arg}(z_1) - \text{Arg}(z_2) = \frac{\pi}{2}$

(b) Find the value of $\sqrt{-i}$ where $i = \sqrt{-1}$.

OR,

(a) Prove that $\left(\frac{-1+i\sqrt{3}}{2}\right)^n + \left(\frac{-1-i\sqrt{3}}{2}\right)^n$ is equal to :

(i) 2 if n is multiple of 3.

(ii) -1 if n is not multiple of 3.

(b) Find the smallest positive integer n for which :

$$\left(\frac{1+i}{1-i}\right)^n = 1.$$

9. (a) If $|x| < 1$ prove that : **4+4=8**

$$\log(1-x) = -x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} \dots\dots\dots$$

(b) Find the co-efficient of x^{10} in the expansion of $\frac{1+3x^2}{(1-x^2)^3}$, mentioning the condition under which the result holds.

OR,

(a) Sum the series :

$$1 + \frac{3}{2} + \frac{6}{3} + \frac{10}{4} + \dots\dots\dots\infty$$

(b) Find the middle term in the expansion of $\left(2a - \frac{a^2}{4}\right)^9$.

10. (a) Find the co-ordinates of a point whose distance from (3, 5) is 5 units and from (0, 1) is 10 units. **4+4=8**

(b) Obtain the equation of plane passing through the line of intersection of planes :
 $7x - 4y + 7z = 16$ and $4x + 3y - 2z = 0$
 and perpendicular to the plane $x - y - 2z + 5 = 0$.

P.T.O.

OR,

- (a) Find the angle between the lines
 $y = m_1x + c_1$ and $y = m_2x + c_2$.
 Also obtain condition for perpendicularity and parallelism.
- (b) Show that the joins of the point (0, 2, -1), (1, 0, 0) and (1, 2, -2), (3, -1, 1) intersect.
11. (a) Using 1's complement method find the value of $(D5F.4A)_{16} - (7531.152)_8$ as a decimal number. **4+4=8**
- (b) Draw a flow-chart to find maximum of three given numbers.

OR,

- (a) Convert 5745.32 and $(5742.163)_8$ into a hexadecimal number.
- (b) Write a BASIC program to find sum and product of three given numbers.

Hindi Version

भाग : कक्षा 12

1. **10** में से कक्षा 12 के लिए **20x1=20**

(i) दो रेखाओं $y = m_1x + c_1$ और $y = m_2x + c_2$ के बीच का कोण ज्ञात करें।
 दो रेखाओं $y = m_1x + c_1$ और $y = m_2x + c_2$ के लंबाई और समांतरता के लिए शर्तें प्राप्त करें।

(ii) ${}^nC_{18} = {}^nC_{12}$, ${}^{32}C_n = \dots$

(iii) एक प्रवाहचित्र तैयार करें:

(a) 2 संख्याएँ (b) 2 संख्याएँ

(c) 3 संख्याएँ (d) 3 संख्याएँ

(iv) $\left(2x^2 - \frac{1}{x}\right)^{12}$ के प्रसारण में x की शक्ति का योग ज्ञात करें।

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(v) एक 4x4 आव्यूह $\begin{vmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 3 & 7 \\ 6 & 3 & 9 & 15 \\ 1 & 2 & 3 & 4 \end{vmatrix}$ का व्युत्क्रम ज्ञात करें।

- (vi) bdkbz v0; q dh i fjHkk"kk fy[kA
- (vii) $(1 + 2i)(1 + 3i)(3 + 4i)$ dk eki knd gksxk
- (viii) ; fn $\frac{5+xi}{2} = 2\frac{1}{2}$ gks rks x dk eku fudkyA ; fn $i = \sqrt{-1}$
- (ix) ; fn ΔABC ea $a = 2, b = 3$ vks $\sin A = \frac{2}{3}$, rks $\angle B$ dk eku fudkyA
- (x) $\tan^2 q + \cot^2 q$ dk l; ure eku gksxkA
- (xi) $\sin 105^\circ + \cos 105^\circ$ dk eku gksxk A
- (xii) ΔABC ea; fn $a = 18, b = 24$ vks $c = 30$ rks $\sin A$ dk eku gksxk A
- (xiii) $\text{fclnq}(1, -9)$ fdl i kn eavofLFkr gS\
- (xiv) fdl h fclnq dk dkrh; fu; ked $(1, 1)$ gS rks bl dk i ksjj fu; ked i klr djA
- (xv) ewy fclnq l sl jy j[kk $x + \sqrt{3}y = 4$ ij yEc dh yEckbz dk eku gksxkA

- (xvi) fclnq $(4, 5, 0)$ vks $Q(2, 6, 2)$ dks feykusokyh l jy j[kk dk d.c. gksxk A
- (xvii) ; fn ry $3x + y + 4z + 2 = 0$, ry $6x + ky + 8z = 5$, ds l ekulrj gS rks k dk eku gksxk
- (xviii) l jy j[kk tks ry $2x + \sqrt{3}y + 3z = 5$ ij yEc gS rFkk $\text{fclnq}(1, 2, -1)$ xqtjrk gS dk l ehdj .k gksxkA
- (xix) $\log_3^2 \times \log_5^3 \times \log_2^5$ dk eku gS..... A
- (xx) 'BASIC' dk folrkj fy[kA

2. vki'kd fHku ds : i ea0; Dr dja & 4

$$\frac{4x^2 + 5}{(x-2)(x+1)(2x-3)} \text{ vFkok} \frac{x^4}{(x-1)^4(x+1)}$$

3. fdl h vullr xqkkkij Jskh ds i nkadk ; ksx 15 gS vks bu i nkadsoxka dk ; ksx 45 gA Jskh Kkr djA 4

vFkok]

; fn gjkRed Jskh dspok; qok; vks rok; i n Øe'k%a, b, c gks rks l kfer dja fd $bc(q-r) + ca(r-p) + ab(p-q) = 0$.

4. 'Fundamental principle of counting' dksfy [kA
100 vks 1000 dscip fdruh , d h l [; k, j gsf t ueaf l QZ, d gh
7 gA 4

vFkok]

v0; g dh i fj Hkk"kk fy [kA v0; g vks I kjf. kdk ea D; k vUrj gS\
mnkgj .k ndj 0; k [; k dja

5. ; fn $\cot^2 q + \frac{3}{\sin q} + 3 = 0$, rks q dk 0; ki d eku fudkyA 4

vFkok]

I kfc dja fd &

$$2 \tan^{-1} x = \sin^{-1} \left(\frac{2x}{1-x^2} \right) = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right).$$

6. ml oÙk dk I ehdj .k fudky tksy-v{k dks ey fclnql s4 dh njh
Li 'kz djrk gS vks x-v{k ij 6 dk vUr% [k. M dk Vrk gA 4

vFkok]

ml oÙk dk I ehdj .k Kkr djksft I dk dÙæ (h₁, k) gS vks f=T; k
a gA

7. (a) Δ ABC ea I kfc dja & 4+4=8

$$\tan \frac{B-C}{2} = \frac{b-c}{b+c} \cot \frac{A}{2}$$

- (b) ; fn $A + B + C = p$ rks I kfc djks &

$$\frac{\cot A + \cot B}{\tan A + \tan B} + \frac{\cot B + \cot C}{\tan B + \tan C} + \frac{\cot C + \cot A}{\tan C + \tan A} = 1$$

vFkok]

- (a) ; fn a^2, b^2, c^2 I ekulrj Js kh eagks rks I kfc dja

$\cot A, \cot B, \cot C$ I ekulrj Js kh eagA

- (b) I kfc djks &

$$\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$$

8. (a) ; fn z_1, z_2 nks, d h feJ I [; k, j gsf d % 4+4=8

$$|z_1 + z_2| = |z_1 - z_2|$$

I kfc dja $\text{Arg}(z_1) - \text{Arg}(z_2) = \frac{p}{2}$

- (b) $\sqrt{-i}$ dk eku fudky tgl; $i = \sqrt{-1}$ gA

vFkokj

(a) I kfc r djks $\left(\frac{-1+i\sqrt{3}}{2}\right)^n + \left(\frac{-1-i\sqrt{3}}{2}\right)^n$ cjkckj g&

(i) 2 ; fn n rhu dk xqkd g&

(ii) -1 ; fn n rhu dk xqkd ughag&

(b) n dk ll; ure eku fudky) ftl dsfy,

$$\left(\frac{1+i}{1-i}\right)^n = 1.$$

9. (a) ; fn $|x| < 1$ I kfc r dj& **4+4=8**

$$\log(1-x) = -x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} \dots\dots\dots$$

(b) $\frac{1+3x^2}{(1-x^2)^3}$ dsfoLrkj eax¹⁰ dk xqkk& fudky) vk& ; g Hkh

crk, i fd ; g i fj. kke fdl fLFkr ea l gh g&

vFkokj

(a) fuEufyf[kr Jskh dk ; kx fudky):

$$1 + \frac{3}{2} + \frac{6}{3} + \frac{10}{4} + \dots\dots\dots\infty$$

(b) dsfoLrkj ea& ; i n fudky)

10. (a) ml fclnqdk fu; ked fudky) tks(3, 5) I s5 bdkbz rFkk (0, 1) I s10 bdkbz dh njh ij g& **4+4=8**

(b) ml ry dk I ehdj. k fudky) ry $7x - 4y + 7z = 16$ rFkk $4x + 3y - 2z = 0$ dh dVku j[kk I sxtjrk gsvk& ry $x - y - 2z + 5 = 0$ ij yEc g&

vFkokj

(a) I jy j[kk, i & $y = m_1x + c_1$ vk& $y = m_2x + c_2$ dschp dk dsk fudky) nksuka I jy j[kk vk& dsyEc rFkk I ekukUrj gkus dsfy, i frc& k Hkh Kkr dj&

(b) fn [kk, i fd fclnq(0, 2, -1), (1, 0, 0) vk& (1, 2, -2), (3, -1, 1) dks feykuokyh I jy j[kk, i , d ml js dks foHkDr djrh g&

11. (a) bdkbz ij d fof/k dk iz kx dj $(D5F.4A)_{16} - (7531.152)_8$ ml vk/kjh I [; k ds : i ea eku fudky) **4+4=8**

- (b) rhu nh gpl I ; kvka ea l svf/kdre I ; k Kkr djus ds
fy, flow chart r\$ kj djA

vFkok]

- (a) I ; kvka 5745.32 rFkk (5742.163)₈ dks 16 vk/kkj h
I ; k eacnyA
- (b) rhu nh gpl I ; kvka dks tkM/s rFkk xqkk djus ds fy,
'BASIC' i kste fy[ka

