(7 pages) **Reg. No. :** ....

Code No. : 30730 E **Sub. Code : EMMA 31**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

Third Semester

Mathematics — Core

VECTOR CALCULUS AND ITS APPLICATIONS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. If $\vec{A} = 2u\vec{i} + u^2\vec{j}$, $\vec{B} = u\vec{j} + \vec{k}$, then $\frac{d}{du}(\vec{A}.\vec{B}) =$

   (a) $3u$ (b) $3u^2$

   (c) $2u$ (d) u^3

2. If $\vec{f} = (axy - z^3)\vec{i} + (a-2)x^2\vec{j} + (1+a)xz^2\vec{k}$ is irrotational then the value of a is ————

   (a) 4 (b) −4

   (c) 2 (d) 0

3. If $\Phi(x,y,z) = x^3y - 2y^2z^3$ then $\nabla\phi at(1,-1,2)$ is ————

   (a) $-2\vec{i} - 33\vec{j} - 24\vec{k}$ (b) $2\vec{i} + 33\vec{j} - 24\vec{k}$

   (c) $-2\vec{i} + 33\vec{j} - 24\vec{k}$ (d) $2\vec{i} + 33\vec{j} + 24\vec{k}$

4. The value of $div\, curl\, \vec{f} =$ ————

   (a) 0 (b) $\overline{0}$

   (c) $\vec{f}$ (d) 1

5. If $\vec{f} = (x^2 + y^2)\vec{i} + (x^2 - y^2)\vec{j}$ then the value of $\int_c r.dr$ ————

   (a) 0 (b) $\frac{9}{10}$

   (c) $\frac{1}{2}$ (d) 2

6. If $\vec{f} = x^2\vec{i} - xy\vec{j}$ and C is the straight line joining the points (0, 0) and (1, 1) then $\int_C \vec{r}.dr$ is ————

   (a) 1 (b) 0

   (c) −1 (d) 2

7. The value of $\int_0^a \int_0^{\sqrt{a^2-y^2}} dx\,dy$ is ————

(a) $\frac{\Pi}{4}$ (b) $\frac{a\Pi}{2}$

(c) $\frac{\Pi a^2}{4}$ (d) Π

8. The value of $\int_0^a \int_0^a \int_0^a dzdydx$ is ————

(a) a^3 (b) a^2

(c) a (d) 1

9. If R is any closed region of the xy – plane bounded by a simple closed curve C then $\int_C ydx + xdy$ is ————

(a) 1 (b) 0

(c) Π (d) 2Π

10. Green's theorem connects

(a) line integral and double integral

(b) line integral and surface integral

(c) double integral and surface integral

(d) surface integral and volume integral

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Prove that $\nabla f(r) = \left(\frac{f'(r)}{r}\right)\bar{r}$.

Or

(b) Prove that $div(r^n \bar{r}) = (n+3)r^n$. Deduce that $r^n \bar{r}$ is solenoidal iff $n = -3$.

12. (a) Find the unit normal to the surface $x^3 - xyz + z^3 = 1$ at (1, 1, 1).

Or

(b) Prove $\bar{f} = (x^2 - yz)\bar{i} + (y - xz)\bar{j} + (z^2 - xy)\bar{k}$ is irroration.

13. (a) Evaluate $\int_C \bar{f}.dr$ where $\bar{f} = (x^2 + y^2)\bar{i} + (x^2 - y^2)\bar{j}$ and C is the curve $y = x^2$ joining (0, 0) and (1, 1).

Or

(b) Evaluate $\int_{(1,1)}^{(4,2)} \bar{f}.dr$ where $\bar{f} = (x+y)\bar{i} + (y-x)\bar{j}$ along

(i) the parabola $y^2 = x$

(ii) the straight line joining (1, 1) and (4, 2).

14. (a) Evaluate $\iint \vec{A}.\vec{n}dS$ if $\vec{A} = 18z\vec{i} - 12\vec{j} + 3y\vec{k}$ and S is the surface $2x + 3y + 6z = 12$ in the first octant.

Or

(b) Evaluate $\iint_S \vec{A}.\vec{n}\,dS$ if $\vec{A} = z\vec{i} + xj - y^2z\vec{k}$ and S is the surface of the cylinder $x^2 + y^2 = 1$ in the first octant between $z = 0$ and $z = 2$.

15. (a) Evaluate $\iint_S xydydz + y^2dzdx + yzdxdy$ where S is the surface $x^2 + y^2 + z^2 = a^2$.

Or

(b) By using Stoke's theorem prove that $\int_C \bar{r}.dr = 0$ where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Show that the necessary and sufficient condition for a vector function $\bar{f}(u)$ to be constant is $\frac{d\bar{f}}{du} = 0$.

Or

(b) Show that necessary and sufficient condition for $\bar{f}(u)$ to have constant direction is $\bar{f} \times \frac{d\bar{f}}{du} = 0$.

17. (a) Determine the constants a and b so that the surface $5x^2 - 2yz - 9x = 0$ will be orthogonal to the surface $ax^2y + bz^2 = 4$ at the point (1, –1, 2).

Or

(b) Prove that $\bar{f} = e^z\left[(2y + 3z)\bar{i} + 2\bar{j} + 3\bar{k}\right]$ is irrotational. Find a function $\Phi(x, y, z)$ such that $f = grad\Phi$.

18. (a) Evaluate $\int_C \bar{f}.dr$ where $\bar{f} = (x^2 + y^2)\bar{i} - 2xy\bar{j}$ and the curve C is the rectangle in the $x - y$ plane bounded by $y = 0$, $y = b$, $x = 0, x = a$.

Or

(b) Evaluate $\int_C \bar{f}.dr$ where $\bar{f} = (x - y)\bar{i} + (y - 2x)\bar{j}$ and C is the closed curve in the $x - y$ plane $x = 2\cos t$, $y = 3\sin t$ from $t = 0$ at $t = 2\Pi$.

19. (a) Find the area of the region D bounded by the parabolas $y = x^2$ and $x = y^2$.

Or

(b) Evaluate $\iint_S \bar{A}.\bar{n}\, dS$ if $\bar{A} = 4y\bar{i} + 18z\bar{j} - x\bar{k}$ and S is the surface of the portion of the plane $3x + 2y + 6z = 6$ contained with first octant.

20. (a) Verify Gauss divergence theorem for $\bar{f} = (x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$ taken over the rectangular parallelopiped, $0 \le x \le a, 0 \le y \le b, 0 \le z \le c$.

Or

(b) Use Gauss divergence theorem to evaluate $\iint_S \bar{f}.\bar{n}\, dS$ where 011 and S is the surface bounding the region $x^2 + y^2 = 4, z = 0$ and $z = 3$.

———————

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Code No. : 30731 E **Sub. Code : EMMA 32**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

Third Semester

Mathematics — Core

DIFFERENTIAL EQUATIONS AND APPLICATIONS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. $y = cx$ is generally used for ———— differential equation.

   (a) Linear (b) Homogeneous

   (c) Bernoulli's (d) Cauchy's

2. The differential equation $(1+x)dy - ydx = 0$ has the general solution ————

   (a) $y = c(1-x)$ (b) $y = c + x$

   (c) $y = cx$ (d) $y = c + cx$

3. The solution of differential equation $(D^2 - 5D + 4)y = 0$ is ————

   (a) $y = c_1e^x + c_2e^{4x}$ (b) $y = c_1e^{-x} + c_2e^{4x}$

   (c) $y = c_1e^x + c_2e^{-4x}$ (d) $y = c_1e^{-x} + c^2e^{-4x}$

4. The solution of the differential equation $(D^2 + n^2)y = 0$ is ————

   (a) $y = A\cos nx + B\sin nx$

   (b) $y = Ae^{nx} + Be^{-nx}$

   (c) $y = (Ax + B)e^{nx}$

   (d) $y = (Ax + B)e^{-nx}$

5. If 'y' is the distance through which a body falls freely in time 't', its equation of motion is ————

   (a) $\frac{d^2y}{dt^2} = -g$ (b) $\frac{d^2y}{dt^2} = g$

   (c) $\frac{dy}{dt} = g$ (d) $\frac{dy}{dt} = -g$

6. The differential equation of the Brachistochrone problem is ————

   (a) $(1 + y'^2) = k$ (b) $y(1 + y'^2) = k$

   (c) $(1 + y')^2 - k$ (d) $y(1 + y')^2 = k$

7. The partial differential equation of $z=(x+a)^2+(y+b)^2+c^2$ by eliminating the arbitrary constants 'a' and 'b' is ————

(a) $z=p^2+q^2+4c^2$ (b) $z=p^2+q^2+c^2$

(c) $2z=2p^2+q^2+c^2$ (d) $4z=p^2+q^2+4c^2$

8. The partial differential equation of by eliminating the arbitrary constants 'a' and 'b' is ————

(a) $py-qx=0$ (b) $px-qy=0$

(c) $px+qy=0$ (d) $py+qx=0$

9. The general solution of $2p+3q=1$ is ————

(a) $\varphi(2x+3y, y-3z)=0$

(b) $\varphi(2x+3y, y+3z)=0$

(c) $\varphi(3x-2y, y-3z)=0$

(d) $\varphi(2x-3y, y-3z)=0$

10. The solution of $p=\tan(px-y)$ is ————

(a) $y=cx-\tan^{-1}c$ (b) $y=cx+\tan c$

(c) $x=cy+\tan y$ (d) $x=cy+\tan x$

PART B — (5 × 5 = 25 marks)

Answer ALL questions by choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Solve $y-x\dfrac{dy}{dx}=a(y^2+dy/dx)$.

Or

(b) Solve $\dfrac{dy}{dx}+y\cos x=\dfrac{1}{2}\sin 2x$.

12. (a) Solve $p^2+(x+y-2y/x)p+xy+y^2/x^2-y-y^2/x=0$.

Or

(b) Solve $(D^3-D^2-D+1)y=1+x^2$.

13. (a) Solve $x^2\dfrac{d^2y}{dx^2}-(x^2+2x)\dfrac{dy}{dx}+(x+2)y=x^3e^x$.

Or

(b) Solve the equation $L\dfrac{dI}{dt}+RI=E$ under the initial conditions $I=I_0$, $E=E_0e^{-kt}$ at $t=0$.

14. (a) Eliminate the arbitrary function f from $f(x^2+y^2+z^2, z^2-2xy)=0$.

Or

(b) Solve $(y+z)p+(z+x)q=x+y$.

15. (a) Prove that the characteristics of $q=3p^2$ pass through the point (–1, 0, 0) generate the cone $(x+1)^2+12yz=0$.

Or

(b) Solve $p^2+q^2=z^2(x^2+y^2)$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions by choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Solve $\frac{dy}{dx}+\frac{10x+8y-12}{7x+5y-9}=0$.

Or

(b) Solve $(y^2+2x^2y)dx+(2x^3-xy)dy=0$.

17. (a) Solve $(D^4+D^3+D^2)y=5x^2+\cos x$.

Or

(b) Solve $(D^2-2d+4)y=e^x\sin x$.

18. (a) Solve $4x^2\frac{d^2y}{dx^2}+4x^5\frac{dy}{dx}+(x^8+6x^4+4)y=0$.

Or

(b) Find the time required to empty a cylindrical tank 1 metre in diameter and 4 metres long through the hole 5 cm diameter if the tank is initially full and its axis is (a) vertical.

19. (a) Solve $px(y^2+z)-qy(x^2+z)=z(x^2-y^2)$. Find the surface that contains the straight lines $x+y=0, z=1$.

Or

(b) Determine the surface which satisfies the differential equation

$(x^2-a^2)p+(xy-az\tan\alpha)q=xz-\alpha y\cot\alpha$

and passes through the curve $x^2+y^2=a^2$, $z=0$.

20. (a) Solve (i) $q=xp+p^2$ and (ii) $p=y^2q^2$.

Or

(b) Solve $p(1+q^2)=q(z-1)$.

(8 pages) **Reg. No. :** ....

Code No. : 30741 E **Sub. Code : ESMA 31**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

Third Semester

Mathematics

Skill Enhancement Course — COMPUTATIONAL MATHEMATICS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. In the Regula Falsi method, the new approximation x_{n+1} is computed based on ———
   (a) linear interpolation
   (b) quadratic interpolation
   (c) cubic interpolation
   (d) exponential interpolation

2. Choose the transcendental equation from the following ———
   (a) $x^3 - 1 = 0$ (b) $x^3 + x + 1 = 0$
   (c) $x = 1$ (d) $e^x - 1 = 0$

3. The order of convergence in Newton – Raphson method is ———
   (a) 3 (b) 2
   (c) 1 (d) 4

4. Horner's method is to find
   (a) Exact values of the roots of quadratic equation
   (b) Approximate values of the real roots of an equation
   (c) Approximate values of complex roots
   (d) The positive real roots of an equation

5. What is the system of simultaneous equation?
   (a) single equation with multiple variable
   (b) multiple equations with a single variable
   (c) multiple equations with multiple variables
   (d) an equation involving complex numbers

6. The Gauss – Jordan method reduces a original matrix into a ———
   (a) Identity matrix
   (b) Lower triangular matrix
   (c) Diagonal matrix
   (d) Upper triangular matrix

7. Which method is said to be direct method

(a) Gauss Seidal method

(b) Gauss Jacobi method

(c) Gauss Jordan method

(d) All the above

8. Gauss Seidal iteration converges only if the coefficient matrix is

(a) upper triangular

(b) lower triangular

(c) diagonally dominant

(d) banded matrix

9. In solving the Laplace equation $U_{xx} + U_{yy} = 0$, the standard five point formula is

(a) $U_{i,j} = \frac{1}{4}\left[U_{i+1,j+1} + U_{i+2,j-1} + U_{i-1,j-1} + U_{i-1,j+1}\right]$

(b) $U_{i,j} = \frac{1}{4}\left[U_{i-1,j} + U_{i+1,j} + U_{i,j-1} + U_{i,j+1}\right]$

(c) $U_{i,j} = \frac{1}{4}\left[U_{i,j+1} + U_{i,j-1} + U_{i-1,j-1} + U_{i-1,j+1}\right]$

(d) $U_{i,j} = \frac{1}{4}\left[U_{i+1,j+1} + U_{i+1,j-1} + U_{i-1,j+1} + U_{i-1,j-1}\right]$

10. The partial differential equation $\frac{\partial^2 U}{\partial x^2} + 2\frac{\partial^2 U}{\partial x \partial y} + 3\frac{\partial^2 U}{\partial^2 y} = 0$ is

(a) Hyperbolic

(b) Elliptic

(c) Parabolic

(d) Rectangular hyperbola

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Use the method of iteration to solve the equation $3x - \log_{10} x = 6$.

Or

(b) Can we apply iteration method to find the root of the equation $2x = \cos x + 3$ in $\left[0, \frac{\pi}{2}\right]$?

12. (a) Explain the method of Bisection.

Or

(b) Find the real root of $x^3 - 3x + 1 = 0$ lying between 1 and 2 upto three places of decimals by Newton Raphson method.

13. (a) Solve the following system of equations using Gauss elimination method : $x+y+z=9$; $2x-3y+4z=13$; $3x+4y+5z=40$.

Or

(b) Solve the following system of equations by Gauss Jordan method $5x-2y+3z=18$, $x+7y-3z=-22$, $2x-y+6z=22$.

14. (a) Solve $2x+y=3$; $2x+3y=5$ by Gauss Seidel iteration method.

Or

(b) Solve the following equations using relaxation method

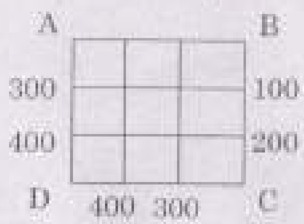
$5x-y-z=3$; $-x+10y-2z=7$;

$-x-y+10z=8$.

15. (a) Classify the equation $u_{xx}+4u_{xy}+(x^2+4y^2)u_{yy}=\sin xy$.

Or

(b) Solve the equation $U_{xx}+U_{yy}=0$ for the following square mesh with boundary values as shown below using Liebmann method.



PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Find the real root lying between 1 and 2 of the equation $x^3-3x+1=0$ upto 3 places of decimal by using Regula Falsi method.

Or

(b) Find the real root of the equation $\cos x=3x-1$ correct to four places of decimals using successive approximation method.

17. (a) Find the real root of $xe^x-2=0$ correct to three places of decimals using Newton Raphson method.

Or

(b) Find the negative root of $x^3-x^2+12x+24=0$ correct to two places of decimals by Horner's method.

18. (a) Find the inverse of the matrix by Gauss elimination $A = \begin{pmatrix} 2 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{pmatrix}$.

Or

(b) Solve the following system of equations by Gauss Jordan method :

$x + y + z = 9;\ 2x - 3y + 4z = 13;$

$3x + 4y + 5z = 40$.

19. (a) Solve the following equations using Jacobi's iteration method. $28x + 4y - z = 32;$ $x + 3y + 10z = 24;\ 2x + 17y + 4z = 35$.

Or

(b) Solve the following system of equations using Gauss Seidal iteration method.

$6x + 15y + 2z = 72;\ x + y + 54z = 110;$
$27x + 6y - z = 85$.

20. (a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2y^2$ in the square mesh given $u = 0$ on the four boundaries dividing the square into 16 subsquares of length 1 unit.

Or

(b) By iteration method solve the elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ over the square region of side 4 satisfying the boundary conditions.

(i) $u(0, y) = 0$ for $0 \le y \le 4$

(ii) $u(4, y) = 12 + y$ for $0 \le y \le 4$

(iii) $u(x, 0) = 3x$ for $0 \le x \le 4$

(iv) $u(x, 4) = x^2$ for $0 \le x \le 4$.

(8 pages) **Reg. No. :** ....

Code No. : 30737 E **Sub. Code : EEST 31**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

Third Semester

Mathematics

Elective — STATISTICS – I

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A frequency distribution has positive skewness if

(a) $\beta > 0$ (b) $\beta_2 = c$

(c) $\beta_1 > 0$ (d) $\beta_2 > 0$

2. $\mu_3 =$ ————

(a) $\mu_3^1 - 3\mu_2^1\mu_1^1 + 2\left(\mu_1^1\right)^3$ (b) $\mu_3^1 + 3\mu_2^1\mu_1^1 + 2\left(\mu_1^1\right)^3$

(c) $\mu_3^1 - 3\mu_2\mu_1^1 + \left(2\mu_1^1\right)^3$ (d) $\mu_3^1 - 3\mu_2\mu_1 + 2\left(\mu_1^1\right)^3$

3. If γ is the correlation co-efficient between x and y, then

(a) $\gamma > 1$ (b) $\gamma < -1$

(c) $-1 \le \gamma \le 1$ (d) 0

4. The spearman's formula for rank correlation is ————

(a) $1 - \frac{6\Sigma(x-y)^2}{n(n^2-1)}$ (b) $1 - \frac{6\Sigma(x+y)^2}{n(n^2+1)}$

(c) $1 + \frac{6\Sigma(x-y)^2}{n(n^2-1)}$ (d) $1 - \frac{6\Sigma(x+y)^2}{n(n^2-1)}$

5. If $b_{xy} \ge 1$, then b_{yx} is always ————

(a) <1 (b) >1

(c) 0 (d) –1

6. The geometric mean of the regression co-efficient is ————

(a) 0 (b) 1

(c) γ (d) –1

7. For any 3 given attributes, total number of negative class frequency is ————

(a) 6 (b) 8

(c) 7 (d) 9

8. If the attributes A and B are completely associated, then the Yule's co-efficient of association $Q =$ ————

(a) 0 (b) 1

(c) −1 (d) 100

9. The value of price relative is given by

(a) $\frac{p_0}{p_1}$ (b) $\frac{p_1}{p_0}$

(c) $\frac{q_1}{q_0}$ (d) $\frac{q_0}{q_1}$

10. $L_{I_{01}} =$ ————

(a) $\frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$ (b) $\frac{\Sigma p_0 q_1}{\Sigma p_1 q_1} \times 100$

(c) $\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$ (d) $\frac{\Sigma p_0 q_0}{\Sigma p_1 q_0} \times 100$

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Find (i) standard deviation (ii) mean deviation about mean (iii) co-efficient of variation for the following marks of 10 students. 20, 22, 27, 30, 40, 48, 45, 32, 31, 35.

Or

(b) The first four moments of a distribution about $x = 2$ are 1, 2.5, 5.5, 16. Find the four moments (i) about the mean (ii) about zero.

12. (a) Find the correlation co-efficient for the following.

x	10	12	18	24	23	27
y	13	18	12	25	30	10

Or

(b) Find the rank correlation co-efficient between Height and weight.

Height	165	167	166	170	169	172
Weight	61	60	63.5	63	61.5	64

13. (a) If $3x + 2y - 26 = 0$, $6x + y - 31 = 0$ are two regression lines then find (i) $\bar{x}, \bar{y}$ (ii) γ_{xy} (iii) σ_y if $\sigma_x = 5$.

Or

(b) Fit a straight line to the following data

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

14. (a) Find whether the following data are consistent? $N = 1000$, $(A) = 300$, $(B) = 400$, $(AB) = 50$.

Or

[P.T.O.]

(b) Check whether the attributes A and B are independent given that

(i) $(A)=30, (B)=60, (AB)=12, N=150$

(ii) $(AB)=256, (\alpha B)=768, (A\beta)=48, (\alpha\beta)=144$.

15. (a) From the chain base index numbers given below, prepare fixed base index number.

Year	1985	1986	1987	1988
Chain base index number	105	108	110	107
Year	1989	1990	1991	
Chain base index number	115	120	125	

Or

(b) Find the cost of living index for 1992 on the base of 1991 from the following data using (i) family budget method (ii) aggregate expenditure method.

Commodity	Price 1991	Price 1992	Quantity 1991
A	7	7.5	6
B	6	6.75	3.5
C	5	5	0.5
D	30	32	3
E	8	8.5	1

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Find Karl Pearson's co-efficient of skewness for the following data.

Age	10-12	12-14	14-16	16-18
Students	4	10	16	30
Age	18-20	20-22	24-24	Total
Students	20	14	6	100

Or

(b) Mean and standard deviation of the marks of 2 classes of sizes 25 and 75 are given below.

	Class A	Class B
Mean	80	85
Standard deviation	15	20

Find combined mean and standard deviation of 2 classes.

17. (a) Let x, y be two variables with standard deviation σ_x, σ_y respectively. If $u = x + ky$, $v = x + \left(\frac{\sigma_x}{\sigma_y}\right)y$, $\gamma_{uv} = 0$, then, find the value of k.

Or

(b) From the following data, of marks obtained by 10 students in physics and chemistry. Calculate the rank correlation co-efficient.

Physics	35	56	50	65	44
Chemistry	50	35	70	25	35
Physics	38	44	50	15	26
Chemistry	58	75	60	55	35

18. (a) Show that the angle between the two regression lines is given by $\theta = \tan^{-1}\left[\left(\frac{r^2-1}{r}\right)\left(\frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}\right)\right]$.

Or

(b) Fit the curve $y = ae^{bx}$ for the following data.

x	1	2	3	4	5	6
y	14	27	40	55	68	300

19. (a) Given $N = 1200$, $(ABC) = 600$, $(\alpha\beta\gamma) = 50$, $(\gamma) = 270$, $(A\beta) = 36$, $(\beta\gamma) = 204$, $(A) - (\alpha) = 192$, $(B) - (\beta) = 620$. Find the remaining ultimate class frequencies.

Or

(b) Find the greatest and least value of (ABC) if $(A) = 50$, $(B) = 60$, $(C) = 80$, $(AB) = 35$, $(AC) = 45$ and $(BC) = 42$.

20. (a) From the following data, construct an index number for 1970 taking 1969 as base year by price relatives method using (i) Arithmetic mean (ii) Geometric mean for averaging the relatives.

Commodities	Price 1969	Price 1970
A	150	170
B	40	60
C	80	90
D	100	120
E	20	25

Or

(b) Calculate (i) Laspeyer's (ii) Paasche's (iii) Fisher's index numbers for the following data given below.

Commodities	Base year 1990		Current year 1992	
	Price	Quantity	Price	Quantity
A	2	10	3	12
B	5	16	6.5	11
C	3.5	18	4	16
D	7	21	9	25
E	3	11	3.5	20

(6 pages) **Reg. No. :** ....

Code No. : 20121 E **Sub. Code : EEVS 31**

U.G. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024.

Third Semester

Part IV

ENVIRONMENTAL STUDIES

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Extensive planting of trees to increase forest cover is called

   (a) Afforestation (b) Agroforestry

   (c) Deforestation (d) Social forestry

2. Energy is released from fossil fuels when they are ________.

   (a) Pumped (b) Cooled

   (c) Burned (d) Pressurized

3. The ecological pyramid always starts with the following at the base

   (a) Decomposer (b) Producer

   (c) Consumer (d) None of these

4. Energy flow in an ecosystem is

   (a) Bidirectional (b) Unidirectional

   (c) Multidirectional (d) All rounds

5. Lions are found in

   (a) Gir Forest (b) Western Ghat

   (c) Sundarban (d) Buxa Forest

6. Endangered species are listed in the

   (a) Red Data book (b) Live stock book

   (c) Dead stock book (d) None of the above

7. The damage caused by acid rain is due to ________ nature of acid rain.

(a) balancing (b) protecting

(c) withstanding (d) corrosive

8. Which of the following is called the secondary air pollutant?

(a) PANs (b) Ozone

(c) Carbon monoxide (d) Nitrogen Dioxide

9. The Indian Environmental Protection Act Came into force in

(a) 1976 (b) 1996

(c) 1986 (d) 1988

10. Who among the following was associated with Bishnoi movement?

(a) Amrita Devi

(b) Gaura Devi

(c) Govind Singh Rawat

(d) Shamsher Singh Bisht

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What are the causes and effects of soil erosion?

Or

(b) Write a short notes on desertification.

12. (a) Describe the energy flow in the ecosystem.

Or

(b) Give a short notes on desert ecosystem.

13. (a) What are the different types of biodiversity?

Or

(b) What are the aims of Project Elephant?

14. (a) Suggest important sources of air pollution.

Or

(b) What is acid rain? What are its harmful effects?

15. (a) Define floods. What are the causes of a flood?

Or

(b) List out the types of environmental ethics.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Explain in detail account on renewable and nonrenewable energy source.

Or

(b) How are dam built? And mention the benefits and problem of dam.

17. (a) Discuss the structure and function of ecosystem.

Or

(b) Give a detail account on ecological succession and its types.

18. (a) What is biodiversity? Explain different types of biodiversity.

Or

(b) Differentiate between in-situ and ex-situ conservation of Bio-diversity.

19. (a) What are the different source of water pollution? Discuss the effects of water pollution on human health.

Or

(b) What is ozone depletion? What are the causes, effects and control measures of ozone depletion?

20. (a) Explain in detail note on silent valley environment movement.

Or

(b) Explain a detail account on Environmental Protection Act.

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