# SANT GADGE BABA AMRVATI UNIVERSITY, AMRAVATI
## Summer Examination 2020
## HVPM's College of Engineering and Technology, Amravati
## Department of First Year Engineering
### Bachelor of Engineering Sem. :- I & II

**Subject :-Engineering Mathematics II** **Code :- IBI**

**Instructions:-**

1) **Solve any two questions**
2) **All question carry equal marks**

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**Q1.**

a) By using method of partitioning find inverse of A where

$$A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 3 & 2 \\ -1 & 2 & 1 \end{bmatrix}$$ **02 Credit Point**

b) Obtain the Fourier series to represent $f(x) = \frac{1}{4}(\pi - x)^2 \quad 0 < x < 2\pi$ **02 Credit Point**

c) Verify the rule of DUIS for the integral $\int_a^{a^2} logax\, dx$ **01 Credit Point**

d) Show that the reduction formula for $I_{m,n} = \int cos^m x\, cosnx\, dx$ is
$(m+n)I_{m,n} = cos^m x\, cosnx + m\, I_{m-1,n-1}$ **02 Credit Point**

e) Evaluate $\iint \frac{dx\, dy}{x^4+y^2}$ where $x \geq 1, y \geq x^2$ **01 Credit Point**

f) Evaluate $\int_0^{\log 2} \int_0^{x} \int_0^{x+\log y} e^{x+y+z} dz\, dy\, dx$ **02 Credit Point**

**Q2.**

a) Find all the eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$ **02 Credit Point**

]b)Find the Fourier series of $f(x) = 0, \quad -2 < x < -1$

$k, \quad -1 < x < 1$

$0, \quad 1 < x < 2$ **02 Credit Point**

c) Show that the volume of the tetrahedron having $\bar{A} + \bar{B},\ \bar{B} + \bar{C}\ \ \bar{C} + \bar{A}$ as concurrent edges is twice the volume of tetrahedron having as concurrent edges **01 Credit Point**

d) Find the perimeter of the curve r=a(1-cos$\theta$) **01 Credit Point**

e) Evaluate $\iint (x+y)^2 dxdy$ over the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
**02 Credit Point**

f) Evaluate $\int_0^{a} \int_0^{x} \int_0^{x+y} e^{x+y+z} dz\, dy\, dx$ **02 Credit Point**

**Q3.**

a) Determine the rank of A ,

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$$ **02 Credit Point**

b) If $f(x) = mx, \quad 0 \le x \le \frac{\pi}{2}$

$= m(\pi - x), \ \frac{\pi}{2} \le x \le \pi$

show that $f(x) = \frac{4m}{\pi}\left(\frac{sinx}{1^2} - \frac{sin3x}{3^2} + \frac{sin5x}{5^2}\right)$ **02 Credit Point**

c) Show that $i\ x\ (\bar{a}\ x\ i) + \ j\ x\ (\bar{a}\ x\ j) + \ k\ x\ (\bar{a}\ x\ k) = 2\bar{a}$ **01 Credit Point**

d) If $I_n = \int_0^{\pi/4} tan^n\theta\ d\theta$ then prove that $I_n + I_{n-2} = \frac{1}{n-1}$ **01 Credit Point**

e) change the order of integration and hence evaluate $\int_0^a \int_0^{2\sqrt{xa}} x^2 dxdy$ **02 Credit Point**

f) Evaluate $\int\int\int \frac{1}{x^2+y^2+z^2} dx\ dy\ dz$ throughout the volume of sphere $x^2 + y^2 + z^2 = a^2$

**02 Credit Point**

**Q4.**

a) Determine for what values of λ and μ the system of equations: $2x + 3y + 5z = 9,\ 7x + 3y - 2z = 8,\ 2x + 3y + \lambda z = \mu$ have (i) No solution (ii) unique solution (iii) An infinite no of solution. **02 Credit Point**

b) The following table gives the variation of periodic current over a period

| 0 | $T/6$ | $T/3$ | $T/2$ | $2T/3$ | $5T/6$ | $T$ |
|---|---|---|---|---|---|---|
| 1.98 | 1.30 | 1.05 | 1.30 | - 0.88 | - 0,25 | 1.98 |

**02 Credit Point**

c) i] Prove that $\left[\bar{a}x\bar{b} \quad \bar{b}x\bar{c} \quad \bar{c}x\bar{a}\right] = \begin{vmatrix} \bar{a}.\bar{a} & \bar{a}.\bar{b} & \bar{a}.\bar{c} \\ \bar{b}.\bar{a} & \bar{b}.\bar{b} & \bar{b}.\bar{c} \\ \bar{c}.\bar{a} & \bar{c}.\bar{b} & \bar{c}.\bar{c} \end{vmatrix}$

ii] Find the volume of tetrahedron with vertices at the points (0,0,0) , (1,1,1), (2,1,1), and (1,2,1). **02 Credit Point**

d) Show that $B(m,\ m).B\left(m + \frac{1}{2}, m + \frac{1}{2}\right) = \frac{\pi}{m} 2^{1-4m}$ **01 Credit Point**

e) Evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2} dxdy$ by changing into polar coordinates. **02 Credit Point**

f) Show by triple integration the volume of sphere of radius a is $\frac{4\pi a^3}{3}$ **01 Credit Point**