SHAMBHUNATH INSTITUTE OF ENGINEERING AND TECHNOLOGY

Subject Code : BAS 103 **Subject : ENGINEERING MATHEMATICS-I**

Course : B.Tech. **SEMESTER: I**

FIRST SESSIONAL EXAMINATION, ODD SEMESTER, (2022-2023)

(Only for Sec E)

Time –1hr 30 min **Maximum Marks – 30**

SECTION – A

1. Attempt all questions in brief.

Q N	QUESTION	Marks	CO	BL
a.	If $u = \frac{x^3 y^3}{x^3+y^3}$, find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$	2	CO1	L2
b.	If $x = r\cos\theta, y = r\sin\theta$, find $\frac{\partial y}{\partial \theta}$.	2	CO1	L2
c.	State Euier's Theorem.	2	CO1	L3
d.	If $y = sin^2 x\, cos^3 x$ find y_n.	2	CO1	L3

SECTION - B

2. Attempt any *ONE* of the following.

Q N	QUESTION	Marks	CO	BL
a.	If $y = \cos(m\, sin^{-1}x)$, prove that $(1-x^2)\, y_{n+2} - (2n+1)\, xy_{n+1} + (m^2 - n^2)y_n = 0$	5	CO1	L3
b.	If z = f (x, y) where $x = e^u \cos v$, $y = e^u \sin v$, show that $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = e^{-2u}\left[\left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2\right]$	5	CO1	L3

3. Attempt any *ONE* of the following.

Q N	QUESTION	Marks	CO	BL
a.	Verify Euler's Theorem for $u = x^2\, tan^{-1}\left(\frac{y}{x}\right) - y^2\, tan^{-1}\left(\frac{x}{y}\right)$	5	CO1	L3

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b.	If $If\ z^3 - 3\,y\,z - 3\,x = 0$ *show that* $z\left[\frac{\partial^2 z}{\partial x \partial y} + \left(\frac{\partial z}{\partial x}\right)^2\right] = \frac{\partial^2 z}{\partial y^2}$	5	CO1	

SECTION - C

4. Attempt any *ONE* part of the following :

Q N	QUESTION	Marks	CO	BL
a.	If $u = tan^{-1}(x^2 + 2\,y^2)$, *show that* $(i)\ x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$ $(ii)\ x^2 u_{xx} + 2\,x\,y\,u_{xy} + y^2 u_{yy}$	6	CO1	L4
b.	If $If\ x^x\,y^y\,z^z = c$ *show that at* $x = y = z, \frac{\partial^2 z}{\partial x\,\partial y} = -(x \log ex)^{-1}$	6	CO1	L3

5. Attempt any *ONE* part of the following :

Q N	QUESTION	Marks	CO	BL
a.	If $\theta = t^n\,e^{-\frac{r^2}{4t}}$ find what value of n will make $\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial \theta}{\partial r}\right) = \frac{\partial \theta}{\partial t}$	6	CO1	L4
b.	If $\emptyset\,(c\,x - a\,z,\ c\,y - b\,z) = 0$, *show that* $a\,p + b\,q = c$, *where* $p = \frac{\partial z}{\partial x}$ *and* $q = \frac{\partial z}{\partial y}$	6	CO1	L3

Bloom's Taxonomy Level (BL) :-
Remember (L1), Understanding (L2), Apply (L3), Analyze (L4), Evaluating (L5), Creating (L6)