GIET MAIN CAMPUS AUTONOMOUS GUNUPUR - 765022

R2A19001003

Registration No:

Total Number of Pages : 3 **B.TECH**

2^{nd} Semester Regular Examination -April-May 2019

BBSBS2010 - Engineering Mathematics-II

(Regulations 2018)(Common to all Branches)

Time : 3 Hours Maximum : 100 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) 2x10=20 Marks

Q.1. Answer *All* Questions.

a. The solution of $xp+yq=z$ is **[CO1] [PO2]**

(i) $f(x^2, y^2)=0,$ (ii) $f(xy, yz)=0,$ (iii) $f(x^2, y^2)=0,$ (iv) $f\left(\frac{x}{y}, \frac{y}{z}\right)=0.$

b. The equation $u_x e^y = u_y e^x$ gives the general solution **[CO1] [PO1]**

(i) $u = ae^x - be^x$ (ii) $u = e^x + e^y$

(iii) $u = a(e^x + e^y) + b$ (iv) none of these.

c. A solution of $u_{xx} = 0$ is of the form **[CO1] [PO2]**

(i) $\int f(y)dy + g(x),$ (ii) $\int f'(y)dy + f(y)dx,$

(iii) $\int f(y)dx,$ (iv) $\int f(x)dx + f(y)dy.$

d. The Laplace Transform of $t^{-1/2}$ is **[CO2] [PO2]**

(i) $\pi/\sqrt{s}$ (ii) $\sqrt{\pi/s}$ (iii) $\frac{\sqrt{\pi}}{2s^{3/2}}$ (iv) none of these.

e. $L\{\delta(t-a)\}$ equals **[CO2] [PO1]**

(i) e^{-as} (ii) $\frac{e^{-as}}{s}$ (iii) 1 (iv) none of these.

f. The potential f $(= grad\, v)$ for $v=(3x, 5y, -4z)$ is **[CO3] [PO1]**

(i) xyz (ii) $3x+5y-4z$ (iii) $60xyz$ (iv) none of these.

g. If $f = 3x^2 + 4y^{3/2} - 4\sqrt{z},$ then $curl(grad\ f)$ is equal to **[CO3] [PO2]**

(i) 0 (ii) 1 (ii) $x+y-z$ (iv) none of these.

h. Green's theorem establish a relation between **[CO4] [PO1]**

(i) line integral & surface integral (ii) surface integral & triple integral

(iii) line integral & double integral (iv) none of these.

i. If $x = r\cos\theta \,\&\, y = r\sin\theta,$ then $\frac{\partial(x, y)}{\partial(r, \theta)}$ is equal to **[CO4] [PO2]**

(i) θ (ii) r (iii) $\tan\theta$ (iv) none of these.

j The value of the line integral $\oint_C F(r)dr$ over a straight line from (0, 0) to (2, 0) and over a circle from (0, 0) to (2, 0) with $curl(F)=0$ is **[CO4] [PO1]**

(i) occasionally same (ii) always same

(iii) always different (iv) occasionally different.

PART – B: (Short Answer Questions) 2x10=20 Marks

Q.2. Answer *ALL* questions

a.	Form a partial differential equation for the curve $z=(x+A)(y+B)$, where A and B are arbitrary constants.	**[CO1] [PO1]**
b.	Define the complete solution and general solution of a partial differential equation.	**[CO1] [PO2]**
c.	Give an example of a function of which Laplace Transform does not exist. Also, justify your answer.	**[CO2] [PO2]**
d.	Find the Laplace Transform of $2^t \sin 3t$.	**[CO2] [PO1]**
e.	Find the inverse Laplace Transform of $\frac{2s+16}{s^2-16}$.	**[CO2] [PO2]**
f.	Find the unit normal vector to the surface $x^2+y^2=25$ at $(2,3)$.	**[CO3] [PO1]**
g.	Prove that $f=z-\sqrt{(x^2+y^2)}$ satisfies the Laplace equation.	**[CO3] [PO2]**
h.	Write the conditions for the solenoidal and irrotational flow of fluid.	**[CO3] [PO1]**
i.	State divergence theorem of Gauss.	**[CO4] [PO1]**
j	Find the parametric form of $x^2+y^2+\frac{1}{4}z^2=1$.	**[CO4] [PO2]**

PART – C:Answer *ALL* questions 15x4=60 Marks

Q.3

a. Solve: $x(y-z)p+y(z-x)q=z(x-y)$. **[CO1] [PO1]**

b. Use Charpit's method to solve: $(p^2+q^2)y=qz$. **[CO1] [PO1]**

(7+8)Marks

OR

c. Solve: $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=xyz$. **[CO1] [PO1]**

d. Find the complete integral of $xp+3yq-2z+2x^2q^2=0$. **[CO1] [PO1]**

(7+8)Marks

Q.4

a. Use Laplace Transform to solve: **[CO2] [PO2]**

$$y''+5y'+4y=2e^{-2t};\, y(0)=y'(0)=0.$$

b. Find the Laplace Transforms of **[CO2] [PO2]**

(i) $te^{-t}\cos t$ and (ii) $t^2(\sin \pi t+\cos 2t)$.

(7+8)Marks

OR

c. Use Laplace Transform to solve: **[CO2] [PO2]**

$$y(t)+2e^t\int_0^t e^{-u}y(u)du=te^t.$$

d. Find the inverse Laplace Transforms of **[CO2] [PO2]**

(i) $\frac{s}{(s^2+\pi^2)^2}$ and (ii) $\ln\left(\frac{s+a}{s+b}\right)$.

(7+8)Marks

Q.5

a. Find the directional derivative of $f = x^2 + 3y^2 + 4z^2$ at $(1,0,1)$ in the direction of $\vec{a} = -\hat{i} - \hat{j} + \hat{k}$. Also, find the direction in which it is maximum. **[CO3] [PO1]**

(7+8)Marks

b. If $\vec{F} = xyz(x\hat{i} + y\hat{j} + z\hat{k})$, then find Div ($\vec{F}$) and Curl ($\vec{F}$). **[CO3] [PO2]**

OR

c. If a continuously differentiable vector function is the gradient of a scalar function f, then prove its curl is a zero vector. Also, prove that the divergence of the curl of a twice continuously differentiable vector function v is zero. **[CO3] [PO1]**

(7+8)Marks

d. Prove: (i) $\nabla(f^n) = nf^{n-1}\nabla f$ and **[CO3] [PO2]**

(ii) $div(f\nabla g) - div(g\nabla f) = f\nabla^2 g - g\nabla^2 f$.

Q.6

a. Use Green's theorem to evaluate $\oint_C F(r)dr$ counterclockwise around the boundary C of the region R, where $\vec{F} = (y - x), C : x^2 + y^2 = \frac{1}{4}$. **[CO4] [PO1]**

(7+8)Marks

b. Evaluate $\iint_S \vec{F}.\hat{n}\, dA$, where $\vec{F} = [x, y, z]$ *and S the hemisphere* $x^2 + y^2 + z^2 = 4, z \geq 0$. **[CO4] [PO2]**

OR

c. Evaluate $\int_1^5 \int_0^{x^2} (1 + 2x)e^{(x+y)} dydx$. **[CO4] [PO1]**

d. Evaluate $\oint_C F(r)dr$, where C is the boundary of the surface $x^2 + y^2 = 4;\ z = 1$ oriented counter-clockwise and $\vec{F} = (-3y, 3x, z)$. Also, verify the result by Stoke's theorem. **[CO4] [PO2]**

(7+8)Marks

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