Total No. of Questions – [05] Total No. of Printed Pages : 02

G.R. No.	

Paper Code :- U117-101 (BE-FFFF)

March 2018 / BACKLOG

F. Y. B. TECH. (COMMON) (SEMESTER - I)

Engineering Mathematics-I (ES11171)

(2017 PATTERN)

Time: [**2 Hours**] [Max. Marks: **50**]

Instructions to candidates:

1) **Q.1 is compulsory.**
1) **Answer Q.2 OR Q.3, Q.4 OR Q.5**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required.**

Q.1) a) Find the rank of matrix $\begin{bmatrix} 4 & 1 & 0 \\ 0 & 3 & 8 \\ 4 & 4 & 8 \end{bmatrix}$. [2]

b) Find A^{-1} for an Orthogonal matrix $A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$. [2]

C) Express given complex no. in polar form $1 + \sqrt{2}$ i. [2]

d) By rotating vector $\overline{OA} = 1 + i\sqrt{3}$ in anticlockwise direction through an angle $\frac{\pi}{2}$, we get vector $\overline{OC}$, write the correct value of $\overline{OC}$ in polar form. [2]

e) If y = $(3x + 4)^{50}$ then find y_{51}. [2]

f) If y = x.e^{4x} , then find y_n . [2]

g) Discuss convergence of the series $\sum_{n=1}^{\infty} \left(\frac{3}{5}\right)^n$. [2]

h) If $y = \cos^{-1}(4x^3 - 3x)$, then write the series expansion for y. [2]

i) What will be the coefficient of x^7, in series expansion of $\cos x \cosh x$? [2]

j) Find characteristic polynomial of the matrix $\begin{bmatrix} 2 & -2 & 3 \\ 0 & -1 & 2 \\ 0 & 0 & -1 \end{bmatrix}$. [2]

P.T.O.

Q 2) a)) Find the value of n for which $z = t^n e^{-r^2/4t}$ satisfies the partial differential equation $\frac{1}{r^2}\left[\frac{\partial}{\partial r}\left(r^2 \frac{\partial z}{\partial r}\right)\right] = \frac{\partial z}{\partial t}$. [6]

b) If $u = \tan^{-1}\left(\frac{x^2+y^2}{x-y}\right)$, then Find $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy}$. [6]

c) If $x = r\cos\theta$ and $y = r\sin\theta$ Prove that $\left(\frac{\partial r}{\partial x}\right)_y = \left(\frac{\partial x}{\partial r}\right)_\theta$. [4]

OR

Q3) a) If $u = f\left(x^2-y^2, y^2-z^2, z^2-x^2\right)$ then prove that $\frac{1}{x}\frac{\partial u}{\partial x} + \frac{1}{y}\frac{\partial u}{\partial y} + \frac{1}{z}\frac{\partial u}{\partial z} = 0$. [6]

b)) If $u = \sin^{-1}\left(x^3+y^3\right)^{2/5}$, show that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \frac{6}{5}\tan u\left(\frac{6}{5}\sec^2 u - 1\right)$ [6]

c) If $u.x + v.y = 0$, $\frac{u}{x} + \frac{v}{y} = 1$, Find $\left(\frac{\partial u}{\partial x}\right)_y - \left(\frac{\partial v}{\partial y}\right)_x$ [4]

Q4) a) If $x = r\cosh\theta, y = r\sinh\theta$ then evaluate J = $\frac{\partial(x,y)}{\partial(r,\theta)}$. and J'= $\frac{\partial(r,\theta)}{\partial(x,y)}$. Then Verify J.J' = 1 [6]

b Find the approximate value of $\left[(1.98)^2 + (2.01)^2 + (1.04)^2\right]^{1/2}$. [4]

c) Find stationary values of u= x+y+z, if xy+yz+zx= $3a^2$, by using Lagrange's method. [4]

OR

Q5) a) Find the optimum value of $x^2 + y^2 + 6x + 12$. [6]

b) Examine for the functionally dependent for $u = \frac{x+y}{1-xy}, v = \tan^{-1}x + \tan^{-1}y$. Also find the relation between them if it exists. [4]

c If $x = u+v+w$, $z = u^3+v^3+w^3$, $y = u^2+v^2+w^2$ find $\frac{\partial u}{\partial x}$. [4]

--ALL THE BEST--