**[Total No. of Printed Pages:3]** **CODE NO:- Z-141**

**FACULTY OF ENGINEERING AND TECHNOLOGY**
**S.E (All Branches) Year Examination - June – 2015**
**Engineering Mathematics-III**
**(Revised)**

**[Time: Three *Hours*]** **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

***N.B***
i) Q No.1 and Q.6 are compulsory.
ii) Solve any two from Q.2, Q.3, Q.4 and Q.5.
iii) Solve any two from Q.7, Q.8, Q.9 and Q.10.
iv) Uses of non-programmable calculate is allowed.
v) Figures to the right indicate full marks.
vi) Assume suitable data, if necessary.

SECTION-A

Q.1 Solve any five 10

a) Solve $(D^2 + 2D - 8)y = 0$
b) Solve $(9D^2 - 12D + 4)y = 0$
c) find the P.I. of the equation $(D - 1)^3 y = 4$
d) find the P.I. of the equation $(D^3 - 4D)y = 2cosh2x$
e) If the probability of defective bulbs is 0.2, find the mean and variance of the distribution of a Defective bulbs in a lot of 1000 bulbs.
f) find the area under the normal curve between z = 0 to z = 1.24
g) Find the median from the following data.

| Class | 0-100 | 100-200 | 200-300 | 300-400 | 400-500 |
|---|---|---|---|---|---|
| F: | 8 | 14 | 36 | 27 | 9 |

h) A body weighting 4.9 kg. is hung from a spring, a pull of 10kg. will stretch the spring to 5cm. the body is pulled down 6cm. below the equilibrium position and then released, find the equation of motion.

Q.2 a) Solve $(D^3 - D^2 + 3D + 5)\ y = e^x \cos 2x$ 05

b) Determine Q and I in an R-L-C circuit with L = 0.5H, R = 6 ohms, C = 0.02F and E = 24 sinlot and initial conditions Q = 0, I = 0 at t =0 05

c) Calculate the mean deviation from the mean of the following data. 05

| Class | 0-6 | 6-12 | 12-18 | 18-24 | 24-30 |
|---|---|---|---|---|---|
| F: | 8 | 10 | 12 | 9 | 5 |

Q.3 a) Solve without using method of variation of parameters$(D^2 + D)y = \frac{1}{1+e^x}$. 05

b) Calculate the mean and standard deviation from the following frequency distribution giving the hights of 100 students. 05

| Hights in cm | 60-61 | 61-62 | 62-63 | 63-64 | 64-65 | 65-66 | 66-67 |
|---|---|---|---|---|---|---|---|
| No. of students | 8 | 11 | 17 | 22 | 19 | 13 | 10 |

c) The differential equation of variation of a strut of length l freely hinged at each end is 05
$EI\ \frac{d^2y}{dx^2} + py = \frac{-wl^2}{8}\sin(\frac{\pi x}{l})$, prove that the deflection at the center is $y = \frac{wl^2}{8(Q-P)}$,where $Q = \frac{EI\pi^2}{l^2}$

Q.4 a) Solve by method of variation of parameters $(D^2 + 1)y = \log cosx$ 05

| | | | |
|---|---|---|---|
| | b) | Weights of 4000 students are found to be normally distributed with mean 50kgs and standard deviation 5kgs. Find the no. of students with weights<br>i) Less than 45 kgs ii) Between 45 and 60 kgs. | 05 |
| | c) | A 3 lb weight on a spring stretches it to 6 inches, suppose a damping force λv is present (λ>0). Show that the motion is a) critically damped if λ = 1.5 b) over damped if λ>1.5<br>c) Oscillatory if λ<1.5. | 05 |

Q.5 a) Solve $x^2\frac{d^2y}{dx^2}+3x\frac{dy}{dx}+y=\frac{1}{(1-x)^2}$ 05

b) Determine the constants of the form $y=ax+bx^2$ for the data. 05

| X: | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Y: | 2.1 | 2.4 | 2.6 | 2.7 | 3.4 |

c) Calculate the first four moments about the mean for the following data. 05

| X: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| F: | 1 | 6 | 13 | 25 | 30 | 22 | 9 | 5 | 2 |

## SECTION –B

Q.6 Solve <u>any five</u> 10

a) Find the first approximate value of the root (ie. $x_1$) by Newton-Raphson method for logx-cos x = 0, correct to 2 decimal places.

b) Find f(3) for the data

| X | 1 | 2 | 4 |
|---|---|---|---|
| Fz(x) | 14 | 15 | 5 |

c) find the values of x, y, z in the first Iteration by Gauss seidel method for

$10x+2y+z=9$

$2x+20y-2z=-44$

$-2x+3y+10z=22$

d) find curl $\overline{F}$ , if $\overline{F}=xyi+yzj+zxk.$

e) Show that $\overline{F}=(x+3y)i+(z-3y)j+(x+2z)k$ is a solenoidal vector function.

f) Evaluate $\int_c \overline{F}.d\overline{r}$, where

$\overline{F}=3xyi-x^2j, C: x=y^2$

From (0, 0) to (2, 1)

g) Find $\nabla[f(r)]$.

h) write the formula for Eulers modified method to solve $\frac{dy}{dx}=f(x,y), y(x_0)=y_0$.

Q.7 a) Solve by Gauss seidel method 05

$2x+y+6z=9$

$8x+3y+2z=13$

$x+5y+z=7$

b) Find the directional derivative of $\emptyset=e^{2x-y+z}$ at (1, 1, -1) in the direction towards the point (2, 2, 0) 05

c) Find the work done when a force $\overline{F}=(x^2-y^2+x)i-(2xy+y)j$ move a particle from origin to (1, 1) along a parabola $y^2=x$. 05

Q.8 a) Using Newton-Raphson method find a root of the equation $cosx=xe^x$, correct to three decimal places. 05

b) Prove that $r^n\overline{r}$ is solenoidal only if n= -3 . 05

c) Evaluate by Geen's theorem $\int_c \overline{F}\,.\,d\overline{r}$ , where $C: x^2+y^2=a^2$ and $\overline{F}=(y^3i-x^3j)$ in XY –plane 05

Q.9 a) Find $\frac{dy}{dx}$ at $x = 0.1$ for the data 05

| X | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 2 | 5 | 10 | 14 | 19 |

b) A fluid motion is given by $\overline{V} = (y+z)i + (z+x)j + (x+y)k$. Show that motion is irrotational and hence find the velocity potential. 05

c) By using stoke's theorem evaluate $\int_c [(x^2+y^2)dx + (x^2-y^2)dy]$. Where C is the boundry of the region enclosed by circles $x^2+y^2=9, x^2+y^2=25$ 05

Q.10 a) Find by Runge-Kutta method of order 4, 7(0.8), given that $\frac{dy}{dx} = \sqrt{x+y}, y(0.4) = 0.41$ take h = 0.4. 05

b) Using Euler's modified method, find an approximate value of y at $x = 0.1$, given that $\frac{dy}{dx} = x + y$, $y(0) = 1$ take h = 0.1 05

c) Evaluate $\int_s \overline{F}\,.\,d\overline{s}$ where 05

$\overline{F} = 4xi - 2y^2j + E^2k$ and S is the surface bounding the region $x^2+y^2=4, z=0 \; and \; z=3$.