Total No. of Printed Pages:3

SUBJECT CODE NO:- P-15
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(ALL-BRANCHES) Examination May/June 2017
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. No.6 are compulsory
ii) Solve any two questions from Q. Nos. 2, 3, 4 and 5.
iii) Solve any two questions from Q. Nos. 7, 8, 9 and 10.
iv) Use of non-programmable calculator is allowed.
v) Figures to the right indicate full marks.

Section A

Q.1 Solve any five from the following 10

a) Solve $(D^2 - 4D - 12)y = 0$

b) Solve $(D^2+2\pi D+\pi^2)y=0$

c) Find the P.I. of the equation
$(D^2 + D - 6)y = e^{2x}$

d) Find the P.I. of the equation
$(D^3 + 4D)y = sin2x$

e) Find the mean of the following data

Class	5-10	10-15	15-20	20-25	25-30	30-35	35-40
f:	6	5	15	10	5	4	3

f) Find the area under the normal curve between Z= -1.24 to 1.24

g) For a binomial distribution the mean is 12 and the variance is 4, find all the constants of the distribution.

h) A 2 lb weight – suspended from a spring stretches it 1.5 inches. If the weight is pulled 3 inches below the equilibrium position and released set up a differential equation of motion.

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

b) Calculate the mean deviation from the median for the following data 05

Class	50-100	100-150	150-200	200-250	250-300	300-350
f:	7	18	25	31	15	4

c) An emf of 200V is in series with a 10 ohm resistor, a 1 henry inductor and 0.02 Farad capacitor At t=0, the charge Q and current I are zero. Find Q and I at any time t. 05

Q.3 a) Calculate the mean and standard deviation for the data 05

Class	68-74	75-81	82-88	89-95	96-102	103-109
f:	5	31	40	20	3	1

b) Solve without using method of variation of parameters $(D^2 + 9)\ y = Sec\ 3x$ 05

c) The differential equation of a cantilever beam of length l and weighing w kgs/unit, subjected to a horizontal compressive force P applied at the free end is given by 05

$EI\ \frac{d^2y}{dx^2}+Py = \frac{-1}{2}Wx^2$, *if* $y = \delta$

And $\frac{dy}{dx}=0$ *at* $x=l$ *and*

$\frac{d^2y}{dx^2}=0$ at x=0, find the maximum deflection of the beam

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Q.4 a) Solve by method of variation of parameters 05

$$(D^2+1)y = \frac{1}{1+sinx}$$

b) The income distribution of a group of 10000 persons was found to be normal with mean Rs.7500 and the standard deviation Rs.500. What is the number of persons of this group which have income 05

i) exceeding Rs.6680 ii) exceeding Rs.8320.

c) If a weight 6 lbs hangs from a spring with constant K =12 and no damping force exists, find the motion of weight when an external force 3 cos8t acts, initially x=0, $\frac{dx}{dt} = 0$ Determine whether resonance occurs. 05

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

b) Fit the curve $y = ae^{bx}$ for the data 05

X:	1	2	3	4	5	6
Y:	1.6	4.5	13.8	40.2	125	300

c) The first three moments of a distribution about the value 2 are 1, 16 and -40. Find mean, variance and μ_3 05

Also find the first three moments about x=0

Section B

Q.6 Solve any five 10

a) Find the first approximate value of the root (i.e. X_1) by Newton – Raphson method for $x e^x - 2 = 0$, correct to 3 decimal place.

b) find f (8) for the data

x	5	6	9
f(x)	12	13	14

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

54x + y + z = 110

2x + 15y + 6 z = 72

-x + 6y + 27 z =85

d) Find grad ϕ at (1, -2, -1), if $\phi = 3x^2y - y^3z^2$

e) show that the vector $\bar{v} = e^x \sin y\, i + e^x \cos y\, j$ is irrotational

f)Evaluate $\int_c \bar{F}.d\bar{r}$ Where $F = x^2 i + xy j$

c: y = 0

between points (0,0) to (a,0)

g) find $\nabla^2 (r \log r)$

h) Write statement of Stoke's theorem.

Q.7 a) Solve by Gauss Seidel Method 05

10x + 2y + z = 9

2 x + 20 y - 2z = -44

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-2x + 3y + 10z =22

b) Find the directional derivative of 05

$f = x^2 - y^2 + 2z^2$ at the point

(1,2, 3) in the direction towards the point (2,1,4)

c) Show that vector field 05

$\bar{F}$= 2x ($y^2 + z^3$)i + $2x^2$yj + $3x^2z^2$K

Is conservative. Find the work done in moving a particle from

(-1,2, 1) to (2, 3, 4)

Q.8 a) Find a root of the equation correct to three decimal places 05

logx – cosx = 0

b) Show that f(r)$\bar{r}$ is always irrotational 05

c) Evaluate by Green's theorem 05

$\int_c \bar{F}.d\bar{r}$, where $\bar{F}$ = x^2i + xyj

And c is a triangle having

Vertices A (0,2) , B(2,0) and C (4,2)

Q.9 a) Find $\frac{dy}{dx}$at x = 1.9 for the data 05

x	1.1	1.3	1.5	1.7	1.9
y	0.21	0.69	1.25	1.89	2.61

b) Using stoke's theorem evaluate 05

$$\int_c [(x+y)dx + (2x-z)dy + (y+z)dz]$$

Where c is the boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6)

c) Show that $\bar{F}$ = (6xy + z^3)i + ($3x^2$-z)j + ($3xz^2$-y)k is irrotational. Find scalar ϕ such that F = ∇ϕ. 05

Q.10 a) Use Runge Kutta method of order 4 05

to approximate y when x=1.1,

given that y(1) = 1.2 and

$\frac{dy}{dx}$ = 3x + y^2, take h=0.1

b) Solve by Euler's modified method 05

$\frac{dy}{dx}$ = -xy^2, y(0) = 2

find y (0,2) by taking h = 0.2

c) Evaluate 05

$\iint_s \bar{F}.\hat{n}\,ds$ where

$\bar{F}$= 4xzi -y^2j + yzK and S is the surface of the cube

bounded by x=0, x = 1, y=0, y=1,z=0, z=1

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