SUBJECT CODE NO:- P-140
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(ALL-BRANCHES) Examination MAY/JUNE-2016
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 out of Q.2, 3, 4 & 5.
iii) Solve any two out of Q.7, 8, 9 & 10.
iv) Use of non-programmable calculator 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) Find C.F. of $(D^2 - 2D + 4)^2 y = 0$
b) Solve $(D^4 - 1)y = 0$
c) Find P.I of $(D^2 - 2D + 2)y = x$
d) Find P.I of $(D^2 + \eta^2)x = k\cos(\eta t + \alpha)$
e) Find the probability of getting 4 heads in 6 tosses of a fair coin.
f) Find the area under the normal curve between $Z = -0.46$ and $Z = 2.21$
g) Find the median of 6, 8, 9, 10, 11, 12, and 13.
h) The first three moments about the value 2 of the variable are 1, 16, -40.
Find:- i) Mean, ii) Variance

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

b) Calculate standard deviation and C.V for the following data. 05

Class	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	6	8	17	21	15	11	2

c) An electric circuit consists of an inductance L, a condenser of capacitance C and e. m. f $E = E_0\, cos\, wt$ so that the charge Q satisfies the differential equation. 05
$\frac{d^2Q}{dt^2} + \frac{Q}{L_C} = \frac{E}{L}\ if\ w^2 = \frac{1}{L_C}$ And initially at t=0, Q=Q_0 and i=i_0. Find the charge at any time t.

Q.3 a) Solve$(x+1)^2\frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} + y = 2\cos[\log(x+1)].$ 05

b) Find Karl Pearson's coefficient of skewness for 05

Class	17.5-20.5	20.5-23.5	23.5-26.5	26.5-29.5	29.5-32.5
Frequency	10	16	192	299	194

c) Wireless sets are manufactured with 25 soldered joints each on the average 1 joint in 500 is defective. How many sets can be expected to be free from defective joints in a consignment of 10000 sets? 05

Q.4 a) Solve by method of variation of parameters $(D^2 - 2D + 2)y = e^x tanx$ 05

b) In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find. 05

1) How many students score between 12 and 20?

2) How many score above 12?

3) How many score 18?

c) The results of measurement of electric resistance R of a copper bar at various temperature t^0C are listed below. 05

t:	19	25	30	36	40	45	50
R:	76	77	79	80	82	83	85

Find a relation $R = a + bt$ when a and b are constants to be determined by you.

Q.5 a) The deflection of a strut of length l with one end (x=0) built in and the other supported end subjected to end thrust P, satisfies the equation $\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}(l - x)$ Prove that deflection curve is $Y = \frac{R}{P}\left(\frac{\sin ax}{a} - l\cos ax + l - x\right)$, where $al = tan\, al$. 05

b) The first four moments about the working mean 28.5 of a distribution are 0.294, 7.144, 42.409 and 454.98. Calculate the moments about mean. Also find $\beta_1 and\ \beta_2$ 05

c) Solve $r\frac{d^2y}{dr^2} + \frac{dy}{dr} - \frac{y}{r} = ar^2$ 05

Section B

Q.6 Solve any five. 10

a) Find the first approximate value of the root (ie, x_1) by Newton-Raphson method for $x\,e^x - 2 = 0$.

b) Find the values of x, y, z in the first iteration by gauss seidel method.

20x+y-2z=17

3x+20y-z=-18

2x-3y+20z=25

c) Find f(7) for data

X	5	6	9
F(x)	12	13	14

d) Find out $\overline{F}$ if $\overline{F} = (y^2cosx + z^3)i + (2y\sin x - 4)j + (3xz^2 + 2)k$

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

f) Find the work done in moving a particle in the force field $\overline{F} = 3x^2i + (2xz - y)j + zk$ along straight line from A(0, 0, 0) to B(2, 1, 3)

g) Find $\nabla\left(\frac{1}{\sqrt{r}}\right)$

h) Write statement of Green's theorem.

Q.7 a) Find by Newton's Raphson method the real root of the equation. $x\,e^x = \sin x$ (Correct to 3 decimal places). 05

b) Find the directional derivative of $\emptyset = e^{2x-y+z}$ at (1, 1, -1) in the direction of the tangent to the curve x=a cost, y=a sint, z=at at $t = \frac{\pi}{4}$. 05

c) A vector field is given by $\overline{F} = \sin y\, i + [x(1 + \cos y)]j$. Evaluate the line integral over a circular path given by $x^2 + y^2 = a^2$, z=0 05

Q.8 a) Solve the following equations by gauss seidel method. The answer should be correct to 3 significant digits. 05

9x+2y+4z=20

X+10y+4z=6

2x-4y+10z=-15

b) Verify the GREENS theorem to evaluate the line integral $\int_c (2y^2 dx + 3x\, dy)$. Where C is the boundary of the closed region bounded by y=x and y=x^2. 05

c) Prove that $\nabla^2(r^\eta) = \eta(\eta+1)r^{\eta-2}$ 05

Q.9 a) Solve by Euler's modified method. 05

$\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$ find y(0.1) (take h=0.1).

b) Use Lagrange's interpolation formula to find y(2) for data given below. 05

X	1	3	4	6
Y	-3	9	30	132

c) Apply stoke's theorem to evaluate $\oint_C 4y\, dx + 2z\, dy + 6y\, dz$. Where C is inter section of curves $x^2 + y^2 + z^2 = 6z$ and $z = x + 3$ 05

Q.10 a) Find $y'(50)$ for the data 05

X:	50	55	60	65
Y:	1.6990	1.7404	1.7782	1.8129

b) Using Runge-Kutte IVth order method find the solution of 05

$\frac{dy}{dx} = 0.25\, y^2 + x^2, y(0) = -1.$

find y(0.1), take h=0.1

c) Find $\iint \overline{F} \,.\, \hat{\eta}\, ds$ where 05

$\overline{F} = (2x + 3z)i - (xz + y)j + (y^2 + 2z)k$ And S is the surface of the sphere having centre (3, -1, 2) and radius 3.