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CODE NO. : P-1164-2013

(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

S.Y. B.Tech. (All) EXAMINATION

NOVEMBER/DECEMBER, 2013

ENGINEERING MATHEMATICS-III

Time-Three Hours | Maximum Marks-80

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

N.B. :- (i) Question No.1 and Question No.6 are compulsory.

(ii) From section A solve any two section questions from the remaining Q.No.2, 3, 4 and 5

(iii) From section B solve any two section questions from the remaining Q.No.7, 8, 9 and 10

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five (each for two marks) 10

(a) Find C.F. of $(D^4 + 2D^2 + 1)y = 0$

(b) Find P.I. of: $(D^2 + a^2)y = sinax$

(c) Find the tangential component of acceleration for the curve:

$x = a\, cost\,, y = a\, sint$

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

(e) Find upper quartile for the data:

Class	Frequency
0-10	10
10-20	40
20-30	20
30-40	0
40-50	10

(f) The three moments about the value 5 are 2 , 20 , 40.

Find:

(i) Mean

(ii) Variance

(g) Convert it into Linear differential equation with constant coefficient:

$$x^2 \frac{d^2y}{dx^2} = 2y + \frac{1}{x}$$

(h) Show that: $\overline{F} = (y^2 cosx + z^3)i + (2ysinx - 4)j + (3xz^2 + 2)k$ is irrotational.

2. (a) Solve: $\frac{d^3y}{dx^3} - 7\frac{dy}{dx} - 6y = e^{2x}(1 + x)$ 5

(b) Find mean deviation about median for the following data: 5

Class	Frequency
0-10	8
10-20	12
20-30	17
30-40	14
40-50	9
50-60	7

(c) Find the radial and transverse component of acceleration for the curve: $r = 3e^{2\theta}$ with constant angular velocity. 5

3. (a) Solve by the method of variation of parameters:

$(D^2 - 2D + 2)y = e^x tanx$ 5

(b) Prove that: $\nabla^2(r^n) = n\,(n+1)\,r^{n-2}$

(c) Find β_2 for the data: 5

Class	Frequency
3-6	4
7-10	7
11-14	15
15-18	10
19-22	3

4. (a) An electric circuit consists of an inductance L,a condenser of capacitance C,and e.m.f.

$E = E_0 cos\omega t$ so that the charge Q satisfies the following differential equation.

$\frac{d^2Q}{dx^2} + \frac{Q}{LC} = \frac{E}{L}$ if $\omega = \frac{1}{\sqrt{LC}}$ and initially at $t = 0$, $Q = Q_0$ and $i = i_0$, find the charge Q

at any time t. 6

(b) If $\overline{A}$ and $\overline{B}$ are irrotational vectors then show that $\overline{A} \times \overline{B}$ is solenoidal vector. 4

(c) Solve: $\frac{d^2y}{dt^2} + \frac{1}{t}\frac{dy}{dt} = 3 + 2\,logt$ 5

5. (a) Solve by general method: $\frac{d^2y}{dx^2} + 9y = sec3x$ 5

(b) The deflection of strut with one end built in and other supported end subjected to end thrust P

satisfies the equation: $\frac{d^2y}{dx^2} + a^2y = \frac{Q^2R}{P}(l - x)$ given that $y = \frac{dy}{dx} = 0,$ when $x = 0$ and

$y = 0\ when\ x = l$ Find the deflection curve and show that $al = tanal$ 5

(c) Prove that:

$\nabla^2 f(r) = f''(r) + \frac{2}{r}\,f'(r)$ 5

Section B

6. Solve any five (Each for two marks) 10

(a) Find: $L\{t^{5/2} + t^3\}$

(b) Find: $L^{-1}\left[\frac{e^{-2s}}{(s-1)^2}\right]$

(c) Find: L { e^{2t}sinht}

(d) Find Fourier sine transform of : e^{-2x}

(e) Write formula to find out Fourier transform for even function and for odd function in the interval :

$-\infty < x < \infty$

(f) If the probability of a defective element is 0.2, find:

(i) mean

(ii) Standard deviation for distribution elements in a total of 200.

(g) If the probability that an individual suffers a bad reaction from a certain injection is 0.001.determine the probability that out of 2000 individuals exactly 2 will suffer a bad reaction.

(h) Find: $L^{-1}\left[\frac{1}{(s-3)^4}\right]$

7. (a) Find: $L\left\{e^{-3t}\int_0^t t\ sin2t\ dt\right\}$ 5

(b) Find the Fourier transform of: 5

$f(x) = x\ , |x| \leq a$

$= 0\ , x| > a$

(c) If 10% of mobiles produced by the company are defective. Determine the probability that out of 10 mobiles chosen at random:

(i) 1

(ii) None

(iii) at most 2 mobiles will be defective. 5

8. (a) Find $L\{f(t)\}$ if : 5

$$f(t) = a\cos\omega t\,, 0 < t < \frac{\pi}{\omega}$$

$$= 0\,, \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} \text{ and } f\left(t + \frac{2\pi}{\omega}\right) = f(t)$$

(b) A manufacturer knows that the condensers he makes contain on an average 1% of defectives. He packs them in boxes of 100. What is the probability that a box picked at random will contain 4 or more faulty condensers (use Poisson distribution) 5

(c) Using the Fourier integral representation show that:

$$\int_0^\infty \frac{\lambda\, \sin\lambda\, x}{\lambda^2 + a^2}\, d\lambda = \frac{\pi}{2}\, e^{-ax}\,, x \geq 0$$ 5

9. (a) Find: $L^{-1}\left\{\frac{5s+3}{(s-1)(s^2+2s+5)}\right\}$

(b) Solve by Laplace Transform: $L\frac{di}{dt} + Ri = E\,,\ i(0) = 0$ 5

(c) Using inverse sine transform find: $f(x)$ if $F_s(\lambda) = \frac{1}{\lambda}\, e^{-a\lambda}$ 5

10. (a) Find : $L^{-1}\left[\frac{1}{(s-1)(s^2+1)}\right]$ by convolution. 5

(b) Express it into Heaviside and hence find Laplace transform of:

$$f(t) = t + 2\,, 0 \leq t \leq 3$$

$$= 3,\ t > 3$$ 5

(c) In male population of 1000, the mean height is 68.16 inches and standard deviation is 3.2 inches, How many men may be more than 72 inches? Where the argument is the standard normal variable. 5

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(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

B.Tech.(All) (Second Year) EXAMINATION

MAY/JUNE, 2014

ENGINEERING MATHEMATICS-III

Time-Three Hours   Maximum Marks-80

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

N.B. :- (i) Question No.1 and Question No.6 are compulsory.

(ii) From section A solve any two section questions from the remaining Q.No.2,3,4 and 5

(iii) From section B solve any two section questions from the remaining Q.No.7,8,9 and 10

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five (each for two marks)   10

(a) Solve: $(D^3+8)y=0$

(b) Find P.I. of: $(D^2+4)y=cos2x\, cos3x$

(c) If: $\overline{r}=xi+yj+zk$ then show that:

(i) $\nabla.\overline{r}=3$

(ii) $\nabla\times\overline{r}=0$

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

(e) Find standard deviation for the data:

(f) The first four moments of a distribution about the value 4 are 2, 5, 10, and 47. Calculate first three moments about mean.

(g) Show that: $r^n\overline{r}$ is solenoidal only if $n=-3$

(h) Convert it into linear differential equation with constant coefficient:

$$r^2\frac{d^2\theta}{dr^2}+r\frac{d\theta}{dr}-\theta=r\,logr$$

2. (a) Solve: $(D^3-7D-6)y=x^2$ 5

(b) Find standard deviation and coefficient of variation for the following data: 5

Class	Frequency
1-10	3
11-20	16
21-30	26
31-40	31
41-50	16
51-60	8

(c) Find the tangential and normal component of acceleration for the curve:

$x=cost+t\,sint\,,\ y=sint-t\,cost$ at any time t. 5

3. (a) Solve by the method of variation of parameters:

$$\frac{d^2y}{dx^2}-y=e^{-x}\sin(e^{-x})+\cos(e^{-x})$$ 5

(b) Find: $\nabla^4(e^r)$

(c) Find Karl Pearson's coefficient of Skewness for the data: 5

Class	Frequency
1-10	3
11-20	16
21-30	26
31-40	31
41-50	16
51-60	8

4. (a) In an L-C-R circuit the charge q on a plate of condenser is given by: $L\frac{di}{dt} + Ri + \frac{q}{c} = E\ sin\omega t$

The circuit is tuned to resonance so that: $\omega^2 = \frac{1}{LC}$ if $R^2 < \frac{4L}{C}$ and $i = 0, q = 0$ when $t = 0$ then find the current in the circuit at any time t. 6

(b) Find div$\overline{F}$ and curl$\overline{F}$ if $\overline{F} = grad(x^2 + xy + z^2)$ 4

(c) Solve: $(1 + x)\frac{d^2y}{dx^2} - 2\frac{dy}{dx} = (1 + x)^4$ 5

5. (a) Solve by general method: $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{e^x}$ 5

(b) Show that $f(r)\overline{r}$ is always irrotational and determine $f(r)$ so that the field is solenoidal. 5

(c) Solve the equation: $EI\ \frac{d^2y}{dx^2} + Py = -\frac{Wl^2}{8}\sin\left(\frac{\pi x}{l}\right)$ for a strut of length $'l'$ freely hinged at each end. Prove that the deflection y at the center is $\frac{Wl^2}{8(Q-P)}$ where $Q = \frac{EI\,\pi^2}{l^2}$ 5

Section B

6. Solve any five (Each for two marks) 10

(a) Find: $L\left\{\frac{sint}{t}\right\}$

(b) Find: $L\{t^{3/2}e^{-t}\}$

(c) Find: $L\left\{\int_0^t cos3t\ dt\right\}$

(d) Find: $L^{-1}\left[\frac{(s^2-1)^2}{s^4}\right]$

(e) Find: $L^{-1}\left[e^{-4s}\frac{1}{s^2+9}\right]$

(f) Find Fourier cosine transform of e^{-x}

(g) Write formula to find Fourier Transform for odd function in the interval $-\infty < x < \infty$ and corresponding inverse Fourier transform.

(h) If the probability of a defective bolt is 0.4, find:

(i) Mean

(ii) Standard deviation for distribution of bolts in a total of 300

7. (a) Find: $L\left\{\int_0^t e^{3t} t\cos 2t\, dt\right\}$ 5

(b) Find the Fourier cosine transform of: 5

$$f(x) = x\,, 0 \le x \le 1$$
$$= 2 - x\,, 1 \le x \le 2$$
$$= 0\,, x > 2$$

(c) In a sampler of 1000 cases, the mean of certain test is 14 and standard deviation is 2.5.Assuming the distribution to be normal, find:

(i) How many students score is between 12 and 15?

(ii) How many score below 8? 5

8. (a) Find $L\{f(t)\}$ if :

$$f(t) = \frac{t}{a}\,, 0 < t < a$$
$$= \frac{(2a-t)}{a}\,, a < t < 2a \text{ and } f(t) = f(t+2a)$$ 5

(b) Find Fourier sine of transform of:

$$f(x) = \frac{1}{x}$$ 5

(c) An insurance company found that only 0.01% of the population is involved in a certain type of accident each year. If its 1000 policyholders were randomly selected from the population, what is the probability that not more that two of its clients are involved in such an accident next year? 5

9. (a) Find: $L^{-1}\left\{\frac{s^2+s-2}{s(s-2)(s+3)}\right\}$ 5

(b) Solve by Laplace Transform: $L\frac{di}{dt} + \frac{1}{C}\int i\, dt = E\, sinpt\,, i = 0, q = 0$ at $t = 0$ 5

(c) Using Fourier integral representation show that: 5

$$\int_0^{\infty} \frac{(1-\cos\lambda\pi)}{\lambda} \sin\lambda x\, d\lambda = \begin{cases} \frac{\pi}{2}\,, 0 \le x \le \pi \\ 0\,,\ x > \pi \end{cases}$$ 5

10. (a) Find : $L^{-1}\left[\frac{1}{(s-3)(s+1)^2}\right]$ by convolution. 5

(b) Express it into Heaviside function and find Laplace transform of:

$f(t) = cost\ , 0 < t < \pi$

$= sint\ , t > \pi$ 5

(c) Find the Fourier transform of: $f(x) = e^{-\frac{x^2}{2}}$ in $-\infty < x < \infty$ 5

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(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

Secon Year B.Tech. (All) (Revised) EXAMINATION

NOVEMBER/DECEMBER, 2014

ENGINEERING MATHEMATICS-III

Time-Three Hours Maximum Marks-80

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

N.B. :- (i) Question No.1 and Question No.6 are compulsory.

(ii) From section A solve any two section questions from the remaining Q.No.2, 3, 4 and 5

(iii) From section B solve any two section questions from the remaining Q.No.7, 8, 9 and 10

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five 10

(i) Write differential equation for LR ckt. With emf Ee^{-at}

(ii) Find P.I. for $(D^2 - 2D + 1)y = sinx$

(iii) If $\beta_2 < 3$, then given distribution is …………

(iv) Is the vector $\overline{F} = (y^2cosx + z^2)i + (2ysinx)j + 2xzk$ is conservative?

(v) Find complete solution of $(D^3 - 7D + 6)y = 8$

(vi) $\nabla\, logr =$ …………..

(vii) If $\mu_1 = 0, \mu_2 = 2, \mu_3 = 4$ & $\mu_4 = -6$ then find $\beta_{1\,,}\, \beta_2$

(viii) Write formula for mean and std. deviation for grouped data.

2. (i) Solve: $(D^2 - 2D + 1)y = e^x sinx$ 4

(ii) Solve: $(D^2 + a^2)y = secax$

(iii) $\nabla^2 f(r) = \frac{d^2 f(r)}{dr^2} + \frac{2}{r}\ \frac{df(r)}{dr}$ and hence find $\nabla^2 r^2 logr$

3. (i) Solve :

$$(2x-1)^2 \frac{d^2y}{dx^2} + (2x-1)\frac{dy}{dx} - 2y = 8x + 3$$ 5

(ii) The differential equation for an electric charge q of an electric ckt. Consisting of an inductance L, capacitance C and an alternating e.m.f. E sinωt applied in series is $L\frac{d^2q}{dt^2} + \frac{q}{c} = $ E sin$n$t if the initial current and charge on the condenser are zero prove that the current

$i = \frac{nE}{L(n^2+\omega^2)}\ (cos\omega t - cosnt)$ where $\omega^2 = \frac{1}{LC}$ 5

(iii) Find the directional derivative of $\phi = xy^2 + yz^2$ at the point $(2, -1,\ 1)$ 5

in the direction of the normal to the surface $x\ logz - y^2 + 4 = 0$ at the point $(-1, 2, 1)$.

4. (i) Prove that: : $\overline{F} = (y^2cosx + z^3)i + (2ysinx - 4)j + (3xz^2 + 2)k$ is irrotational.Also find scalar potential ϕ if $\overline{F} = \nabla\phi$ 5

(ii) Calculate coefficient of variation for following data:

Class	Frequency
0-10	3
10-20	16
20-30	25
30-40	36
40-50	12
50-60	2

5

(iii) A body executes damped forced vibrations given by the differential equation

$$\frac{d^2x}{dt^2} + 2k\frac{dx}{dt} + b^2x = e^{-kt}sin\omega t$$

Then solve: (i) for $\omega^2 = b^2 - k^2$ (ii) for $\omega^2 \neq b^2 - k^2$ 5

5. (i) A strut of length l freely hinged at each end, satisfies the equation

$EI\frac{d^2y}{dx^2} + Py = -\frac{wl^2}{8}\, sin\frac{\pi}{l}x$ prove that the deflection at the centre is

$\frac{wl^2}{8(Q-P)}$ where $Q = \frac{EI\pi^2}{l^2}$ 5

(ii) What will be the mode for the following data. 5

Class	Frequency
0-5	7
5-10	11
10-15	9
15-20	21
20-25	16
25-30	15
35-40	28

5

(iii) A particle moves along the curve $r = (t^3 - 4t)i + (t^2 + 4t)j + (8t^2 - 3t^3)k$ 5

where t is a time .Then find tangential and normal component of acceleration at $t = 2$.

Section B

6. Solve any five 10

(i) $L\{f(t)\, u(t-a)\} =$ …………….

(ii) If $L\{f(t)\} = f(s)$ then $L\left\{\int_0^t f(t)dt\right\} =$ …………..

(iii) $L\{\cos(2t-1)\} =$ …………..

(iv) $L^{-1}\left\{\frac{2+2s+s^2}{s^3}\right\} =$…………….

(v) If $f(x)$ is neither even nor odd then $F(\lambda) =$ ……………

(vi) Find Fourier cosine transform of

$$f(x) = 1\ , |x| < 1$$
$$= 0\ , |x| > 1$$

(vii) If six dice are thrown what is the probability that outcome will be either 4 or 5.

(viii) For Poisson distribution $P(r) =$ ……………..

7. (i) If $f(x) = cosx\ , x > a$

$$= 0\ , x < a$$

Then find its Fourier transform. 5

(ii) Find Laplace transform of any two 10

(a) $sint\ \delta\left(t - \frac{\pi}{2}\right) - t^2\ H(t-2)$

(b) $\int_0^t \int_0^t t\ sint\ dt\ dt$

(c) $t\ e^{-2t} sint$

8. (i) Find inverse Laplace transform of any two 10

(a) $\frac{2s}{(s^2-4)^2}$

(b) $Log \frac{s^2+4}{s^2+6}$

(c) $\frac{se^{-\pi s}}{s^2+1}$

(ii) Using Fourier integral representation show that

$$\int_0^\infty \frac{1-cos\lambda x}{\lambda}\ sin\lambda x\ d\lambda\ = \begin{cases} \frac{\pi}{2}, 0 < x < \pi \\ 0\ , \quad x > \pi \end{cases}$$ 5

9. (i) If on an average one ship in every ten is wrecked, find the probability that out of 5 ships expected to arrive, 4 at least will arrive safely. 5

(ii) Use convolution theorem to find inverse Laplace transform of $\frac{s}{(s+4)(s^2+9)}$ 5

(iii) Find Fourier sine transform of $\frac{x}{1+x^2}$ 5

10. (i) In a regiment of 1000, the mean height of soldiers is 68.12 inches and std.deviation is 3.374 inches. Assuming a normal distribution, How many soldiers could be expected to be more than 72 inches?

(ii) Find solution of $\frac{d^2y}{dt^2} + y = e^{-t}$ where $y(0) = 1, y'(0) = -2$ by Laplace transform method. 5

(iii) Find Fourier sine transform of $\frac{1}{x}$ 5

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(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

B.Tech.(All) (Second Year) EXAMINATION

MAY/JUNE, 2015

ENGINEERING MATHEMATICS-III

Time-Three Hours   Maximum Marks-80

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

N.B. :- (i) Question No.1 and Question No.6 are compulsory.

(ii) From section A solve any two section questions from the remaining Q.No.2,3,4 and 5

(iii) From section B solve any two section questions from the remaining Q.No.7,8,9 and 10

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five (each for two marks) 10

(i) Differential equation of an electric ckt containing an inductance L, capacitance C and Resistance R (without battery) is ……

(ii) $\frac{1}{D-k}X(x) = \ldots\ldots$ where $X(x)$ is a function of x

(iii) The C.F. of the equation $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - 4y = x^2$ is ……….

(iv) If $f(b) = 0$ then $\frac{1}{f(D)}\, e^{bx} = \ldots\ldots\ldots\ldots$

(v) Is the vector $\overline{F} = (siny + z)i + (xcosy - z)j + (x - y)k$ is irrotational?

(vi) $\nabla r^n = \ldots\ldots\ldots\ldots\ldots\ldots$

(vii) Relation between Mean deviation and std. deviation is ……..

(viii) If $\beta_2 = 3$, then the nature of distribution is …………

2. (i) Solve : $(D^2 - 4D + 3)y = e^x cos2x$ 5

(ii) Solve: $(D^2 + a^2)y = cosecax$ by general method. 5

(iii) If $\bar{r}$ is the position vector, prove that: $\nabla^2 r^n = n(n+1)r^{n-2}$ 5

3. (i) The first four moments of distribution about the value of the variable $x = 5$ are 2 , 20 , 40 and 50. Find moments about mean and β_2 5

(ii) Solve: $(2x+1)^2 \frac{d^2y}{dx^2} - (2x+1)\frac{dy}{dx} + y = 3x + 4$ 5

(iii) Find the directional derivative of the function, $\phi = x^2y + xyz + z^3$ at $(1\ ,2,-1)$ along the normal to the surface $x^2y^3 = 4xy + y^2z$ at $(1\ ,2,0)$ 5

4. (i) Find the std.Deviation and Mean Deviation from the distribution given below :

x	Frequency
$0-10$	8
$10-20$	12
$20-30$	17
$30-40$	14
$40-50$	9
$50-60$	7
$60-70$	4

5

(ii) An uncharged condenser of capacity C is charged by applying an e.m.f of values:

$E\sin\left(\frac{t}{\sqrt{LC}}\right)$ through lead of self inductance L.t gives by the differential equation:

$\frac{d^2q}{dt^2} + \frac{1}{LC}q = \frac{E}{L}\sin\left(\frac{t}{\sqrt{LC}}\right)$ Prove that the charge at any time t is:

$\frac{EC}{2}\left[\sin\left(\frac{t}{\sqrt{LC}}\right) - \frac{t}{\sqrt{LC}}\cos\left(\frac{t}{\sqrt{LC}}\right)\right]$ 5

(iii) Show that the vector field: $\overline{F} = 2xye^{z}i + x^2e^{z}j + x^2ye^{z}k$ is an irrotational vector field and hence find corresponding scalar potential such that $\overline{F} = \nabla\phi$ 5

5. (i) A particle moves in a plane with constant angular velocity ω about O. If the rate of increase of acceleration is totally (wholely) radial prove that : $\frac{d^2r}{dt^2} = \frac{1}{3}r\omega^2$ 5

(ii) A strut of length l freely hinged at each end, satisfies the equation:

$EI\frac{d^2y}{dx^2} + Py = -\frac{wl^2}{8}\sin\left(\frac{\pi}{l}x\right)$ Prove that, the deflection at the centre is $\frac{wl^2}{8(Q-P)}$ where $Q = \frac{EI\pi^2}{l^2}$ 5

(iii) Solve by method of variation of parameter: $(D^3 + D)y = cosecx$ 5

Section B

6. Solve any five (each for two marks) 10

(i) If $f(t) = f(t+T)$ then $L[f(t)] =$ ………..

(ii) If $L^{-1}\{f(s)\} = f(t)$ then $L^{-1}\left[\frac{f(s)}{s}\right] =$ …………

(iii) Find $L^{-1}\left[\frac{3+2s+s^2}{s^3}\right]$

(iv) $L[\delta(t-a)] =$ ……………

(v) If Poisson distribution is such that $P(0) = P(1)$ find mean of the distribution.

(vi) Find Fourier sine transform is $e^{-\beta x}$

(vii) For Poisson distribution, std. deviation = …………

7. (i) Find Laplace transform of any two : 10

(a) $e^t\left(\frac{1-cost}{t}\right)$

(b) $\int_0^t e^{-t}\, t\, sin3t\, dt$

(c) $f(t) = sint, \; 0 < t < \pi$

$\quad = cost \;\; , t > \pi$

(ii) Find Fourier transform of $f(x) = 1 - x^2\ ,\ |x| \leq 1$

$$= 0\ , |x| > 1$$

and hence evaluate $\int_0^\infty \frac{x cos x - sin x}{x^3}\ cos\frac{x}{2}\ dx$ 5

8. (i) Find inverse Laplace transform of any two : 10

(a) $Log\left(\frac{s^2+4}{s^2}\right)$

(b) $\frac{1}{s^2(s+1)}$

(c) $\frac{s+2}{(s^2+4s+7)^2}$

(ii) Find Fourier transform of :

$f(x) = 0\ ,\ x < 0$

$= e^{-x}\ , x > 0$ 5

9. (i) Find inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$ 5

(ii) Find Fourier cosine transform of: $\frac{1}{1+x^2}$ 5

(iii) Certain screw making machine produced on average of 2 defective out of 100, and packs them in boxes of 500.Find the probability that a box contains 15 defective screws. 5

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

(a) How many score above 8?

(b) How many score below 12?

(c) How many score 16? 5

(ii) Show that: $\int_0^\infty \frac{\lambda^2+2}{\lambda^4+5\lambda^2+4} cos\lambda x\ d\lambda = \frac{\pi}{6}\ (e^{-x} + e^{-2x})$ for $x \geq 0$ 5

(iii) Solve: $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + y = e^t$ with $y(0) = 2$ and $y'(0) = -1$ by Laplace transform. 5

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Subject Code: 1212-2015

(Revised Course)

FACULTY OF ENGONEERING AND TECHNOLOGY

Secon Year B.Tech. (All) (Revised) EXAMINATION

NOVEMBER/DECEMBER, 2015

ENGINEERING MATHEMATICS-III

Time-Three Hours Maximum Marks-80

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

N.B. :- (i) Question No.1 and Question No.6 are compulsory.

(ii) From section A solve any two section questions from the remaining Q.No.2, 3, 4 and 5

(iii) From section B solve any two section questions from the remaining Q.No.7, 8, 9 and 10

(iv) Figures to the right indicate full marks.

(v) Assume suitable data if necessary.

Section A

1. Solve any five 10

(i) Using the transform $z = \log(3+2x)$ the equation $(3+2x)^2 \frac{d^2y}{dx^2} + 6(3+2x)\frac{dy}{dx} + 8y = 0$ is transformed constant coefficient L.D.E. is ……..

(ii) C.F. of $\frac{d^2y}{dx^2} - y = e^x + 2$ is ……………

(iii) Complete solution of $(D^2 - 3D + 1)y = 8$ is …………

(iv) $\frac{1}{f(D)}\, e^{ax}w =$ ………….. where w is function of x

(v) Formula for upper quartile is ………

(vi) Std. deviation = ……………….

(vii) $\nabla\, logr =$ …………..

(viii) $\nabla.\left(\overline{A} \times \overline{B}\right) =$ ……………

2. (i) Solve: $(D^2 - 4D + 3)y = x^2 e^x$

(ii) Solve: $(D^2 + 3D + 2)y = 2e^{2x} cos e^{2x} + sin e^{2x}$

(iii) If the directional derivative of $\phi = axy + byz + czx$ at (1,1,1) has maximum magnitude 4 in a direction parallel to z-axis find values of a,b , c

3. (i) Find radial and transverse components of acceleration of a particle describing the curve $r = a(1 + cos\theta)$ with constant angular velocity ω.

(ii) Solve: $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2$logx

(iii) Find mode of the following data:

Class	Frequency
0-5	7
5-10	11
10-15	9
15-20	21
20-25	16
25-30	15
30-35	8

4. (i) Find β_1 for the following data:

Group	Frequency
1-3	5
3-5	9
5-7	3
7-9	4
9-11	6
11-13	11

(ii) Solve by general method: $(D^2 + 2D + 1)\ y = e^{-x}$ logx

(iii) An electic ckt. Consists of an inductance L, condenser of capacitance C and e.m.f. $E = E_0 cos\omega t$ so that the charge q satisfies the differential equation

$\frac{d^2q}{dt^2} + \frac{q}{LC} = \frac{E_0}{L}\ cos\omega t$ if $\omega = \frac{1}{\sqrt{LC}}$ and initially at $t = 0, q = q_0$ and $i = i_0$ find charge q at any time t.

5. (i) The deflection of a strut with one end built in and other end supported and subjected to end thrust P satisfies the equation $\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}(l - x)$, Given that $y = \frac{dy}{dx} = 0$ when $x = 0$

Prove that $y = \frac{R}{P}\left(\frac{sinax}{a} - lcosax + l - x\right)$ and $al = tanal$ when $y = 0$ at $x = l$

(ii) Show that the vector $\overline{F} = (x^2 - yz)i + (y^2 - xz)j + (z^2 - xy)k$ is irrotational and find corresponding scalar point function ϕ such that $\overline{F} = \nabla\phi$

(iii) Prove that: $\nabla . r^n\overline{r} = (n + 3)r^n$

Section B

6. Solve any five 10

(i) If $L\{f(t)\} = f(s)$ then $L\left\{\int_0^t f(t)dt\right\} =$ …………..

(ii) $L[\cos(\omega t + \beta)] =$………..

(iii) $L^{-1}(1) =$ ……………

(iv) $L\{t^m f(t)\} =$ …………… where m is + ve integer.

(v) Fourier sine transform of $f(x) = e^{-2x}$ is …………

(vi) Recurrence relation for Poisson distribution is …………

(vii) Binomial distribution = ………….. if frequency N is given.

(viii) If a function is neither even nor odd then its Fourier transform is …………

7. (i) If $f(x) = cosx\ , x > a$

$= 0\ , x < a$

Then find its Fourier transform. 5

(ii) Find Laplace transform of any two 10

(a) $sint\ \delta\left(t-\frac{\pi}{2}\right)-t^2\ H(t-2)$

(b) $\int_0^t \int_0^t t\ sint\ dt\ dt$

(c) $t\ e^{-2t} sint$

8. (i) Find inverse Laplace transform of any two 10

(a) $\frac{2s}{(s^2-4)^2}$

(b) $Log\frac{s^2+4}{s^2+6}$

(c) $\frac{se^{-\pi s}}{s^2+1}$

(ii) Using Fourier integral representation show that

$$\int_0^\infty \frac{1-cos\lambda x}{\lambda}\ sin\lambda x\ d\lambda\ = \begin{cases} \frac{\pi}{2}, 0<x<\pi \\ 0\ , \quad x>\pi \end{cases}$$ 5

9. (i) If on an average one ship in every ten is wrecked, find the probability that out of 5 ships expected to arrive, 4 at least will arrive safely. 5

(ii) Use convolution theorem to find inverse Laplace transform of $\frac{s}{(s+4)(s^2+9)}$ 5

(iii) Find Fourier sine transform of $\frac{x}{1+x^2}$ 5

10. (i) In a regiment of 1000, the mean height of soldiers is 68.12 inches and std.deviation is 3.374 inches. Assuming a normal distribution, How many soldiers could be expected to be more than 72 inches?

(ii) Find solution of $\frac{d^2y}{dt^2}+y=e^{-t}$ where $y(0)=1\ ,y'(0)=-2$ by Laplace transform method. 5

(iii) Find Fourier sine transform of $\frac{1}{x}$ 5

Compiled & Collected by
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