S4 EC (old)

G 1571 (Pages : 3) Reg. No..................................

Name..................................

B.TECH. DEGREE EXAMINATION, MAY 2015

Fourth Semester

ENGINEERING MATHEMATICS – III (CMELRPTANSUF)

(Common to all Branches)

[Old Scheme—Prior to 2010 Admissions
Supplementary / Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*
Each question carries 20 marks.
Use of Statistical table is permitted.

1. (a) By method of variation of parameter solve $y''+4y=4sa^2 2n$. (7 marks)

   (b) Solve $x^3y'''+2x^2y''+2y=10\left(x+\frac{1}{x}\right)$. (8 marks)

   (c) A voltage Ee^{-at} is applied at $t=0$ to a circuit containing inductance L and resistance R, show that the current at any time t is :

   $$\frac{E}{R-aL}\left(e^{-at}-e^{\frac{-Rt}{L}}\right).$$ (5 marks)

Or

2. (a) According to Newton's Law of cooling, the rate at which a substance cools in moving air is proportional to the difference between the temperature of the substance and that of the air. If the temperature of the air is 30° C and the substance cools from 100° C to 70° C in 15 minutes. Find when the temperature will be 40° C.

   (8 marks)

   (b) Solve $y''-3y'+2y=xe^{3x}+\sin 2x$. (7 marks)

   (c) Solve $(D^2+1)^3(D^2+D+1)^2 y=0$. (5 marks)

3. (a) Solve $2zx-px^2-2yxy+pq=0$. (7 marks)

   (b) Solve $(x^2-yz)p+(y^2-zx)q=z^2-xy$. (5 marks)

   (c) Derive the solution of one dimensional wave equation. (8 marks)

Or

Turn over

4. (a) The points of trisection of a string are pulled aside through the same distance on opposite sides of the position of equilibrium and the string is released from the rest. Derive an expression for the displacement of the string at subsequent times act show that the midpoint of the string always remains at rest.

(12 marks)

(b) Solve $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$. (8 marks)

5. (a) Solve the integral equation $\int_0^\infty f(x)\cos \lambda x \, dx = e^{-\lambda}$. (8 marks)

(b) Using Fourier integral show that :

$$\int_0^\infty \frac{\pi \sin \lambda u}{k^2 + \lambda^2} dX = \frac{\pi}{2} e^{-kx}, \; x > 0$$

$$k > 0.$$

(12 marks)

Or

6. (a) Find the Fourier sin and cosine transform of :

$2e^{-3x} + 7e^{-2x}$. (8 marks)

(b) Explain the function $f(x) = \begin{cases} 1, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$ as a Fourier integral.

Hence evaluate $\int_0^\infty \frac{\sin \lambda \cos \lambda x}{x} dx$.

(12 marks)

7. (a) Derive the mean and variance of binomial distribution. (8 marks)

(b) In an examination taken by 500 candidates the average and the standard deviation of grades obtained (normally distributed) are 40% and 10%. Find approximately :

(i) How many will pass, if 50% is fixed as minimum ?

(ii) What should be the minimum of 350 candidates are to pass ?

(iii) How many have scored above 60% ?

(12 marks)

Or

8. (a) Fit a Poisson distribution to the following data :

x :	0	1	2	3	4
f :	122	60	15	2	1

(12 marks)

(b) Six dice are thrown 729 times. How many times do you expect atleast three dice to show a five or six ?

(8 marks)

9. (a) A bag contains defective articles, the exact number of which is not known. A sample of 100 from the bag gives 10 defective articles. Find the limits for the proportion of defective articles in the bag.

(8 marks)

(b) Random sample drawn from two countries give the following data relating to the heights of adult males :

	Country A	Country B
Mean height ...	67.42	67.25
Standard deviation ...	2.58	2.50
Number in samples ...	1000	1200

(i) Is the difference between the means significant ?

(ii) Is the difference between the standard deviation significant ?

(12 marks)

Or

10. (a) A research worker wishes to estimate mean of a population by using sufficiently large sample. The probability is 95% that sample will not differ from the true mean by more than 25% of the S.D. How large a sample should be taken ?

(10 marks)

(b) The 9 items of a sample have the following values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these values differ significantly from the assumed mean 47.5 ?

(10 marks)

[5 × 20 = 100 marks]