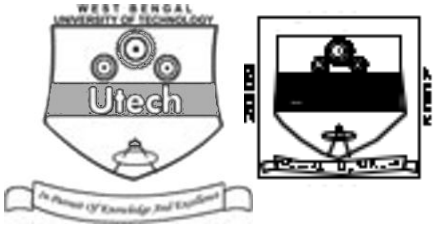
ADVANCED MATHEMATICS & ENGINEERING MECHANICS
(SEMESTER - 2)

CS/B.Pharm (O + N)/SEM-2/M-203/09



1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

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CS/B.Pharm (O + N)/SEM-2/M-203/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ADVANCED MATHEMATICS & ENGINEERING MECHANICS (SEMESTER - 2)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

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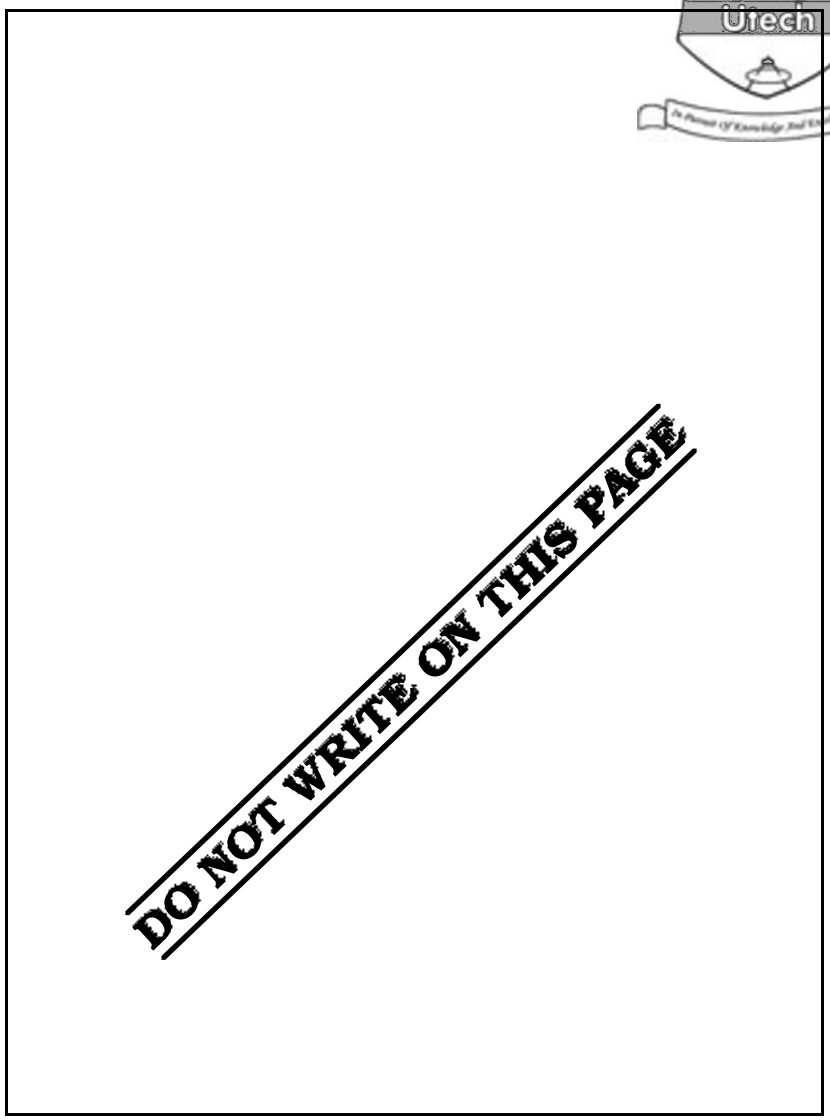
Head-Examiner/Co-Ordinator/Scrutineer

2253 (05/06)



ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ADVANCED MATHEMATICS & ENGINEERING MECHANICS

SEMESTER - 2

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) $\sum_{i} \left(x_i - \bar{x} \right)$ is equal to

a) 0 b) 1

c) – 1 d) none of these. ☐

ii) If each term is increased by 10, then A.M. is increased by

a) 10 b) 15

c) 20 d) none of these. ☐

iii) The A.M. of the numbers 1^2, 2^2, 3^2, ..., n^2 is

a) $\frac{(n+1)(2n+1)}{6}$ b) $\frac{n(2n+1)}{6}$

c) $\frac{n(n+1)(2n+1)}{6}$ d) none of these. ☐

iv) If A be an exent, then $P(A) + P(\bar{A})$ is equal to

a) 1 b) 0

c) 2 d) none of these. ☐

v) If A and B are mutually exclusive, then $P(A + B)$ is equal to

a) $P(A) + P(B)$ b) $P(A) + P(B) + P(AB)$

c) $P(A) + P(B) - P(AB)$ d) none of these. ☐

vi) If the events A and B are independent, then $P(AB)$ is equal to

a) $P(A)\,P(B)$ b) $P(B)\,P(A / B)$

c) $P(A)\,P(B / A)$ d) none of these. ☐

vii) $L\{t\,e^{2t}\}$ is equal to

a) $\frac{1}{p-2}$ b) $2(p-2)^2$

c) $\frac{1}{(p-2)^2}$ d) $\frac{2!}{p^2}$. ☐

viii) If two forces of 100N and 150 N are acting simultaneously at a point and if the angle between them is 45°, then the resultant of these two forces is

a) 232 N b) 230 N

c) 175 N d) 200 N. ☐

ix) The kinetic energy of a body of mass (m) and velocity (v) is equal to

a) mv b) $\frac{mv}{2}$

c) $\frac{m^2v}{2}$ d) $\frac{mv^2}{2}$. ☐

x) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and that of wife's selection is $\frac{1}{5}$. What is the probability that both of them will be selected ?

a) $\frac{1}{5}$ b) $\frac{1}{7}$

c) $\frac{12}{35}$ d) $\frac{1}{35}$. ☐

xi) Let X be a Poisson random variable, such that $2\,P(X = 0) = P(X = 2)$. Then standard deviation of X is

a) 4 b) 2

c) $-\sqrt{2}$ d) $\sqrt{2}$. ☐

xii) If $P(A) = 3/8$, $P(B) = 5/8$ and $P(A \cap B) = 1/4$, then $P(A/B)$ is

a) 2/5 b) 1/5

c) 2/3 d) 1/3. ☐

xiii) The Laplace transform of $t \sinh at$ is

a) $2as/(s^2 - a^2)^2$ b) $2s/(s^2 - a^2)^2$

c) $2a/(s^2 - a^2)^2$ d) $2as/(s^2 - a^2)$. ☐

xiv) The inverse Laplace transform of $1/s(s^2 + 1)$ is

a) $1 + \cos t$ b) $1 - \cos t$

c) $1 + \sin t$ d) $1 - \sin t$. ☐

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Find the centre of mass G of a circular arc of radius a subtending an angle 2α radian at the centre.

3. Given $P(A) = a$, $P(B) = b$ and $P(A \cap B) = c$.

Find the values of

i) $P(A \cup B)$

ii) $P(A^C \cap B)$

iii) $P(A / B)$.

4. Show that the probability that exactly one of the events A and B will occur is

$P(A) + P(B) - 2P(AB)$.

5. The lines of regression connecting two variables x and y be given by $y = 32 - x$ and $x = 13 - 0{\cdot}25\,y$. Obtain the values of the mean and the correlation coefficient.

6. Show that $L(e^{ab}) = \frac{1}{s-a}$.

7. If two forces 5N and 3N are acting on a body at an angle 60°C, find the resultant of the forces. Give the magnitude and the direction of the resultant.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. a) Evaluate $L\{\sin t + \cos t\}$. 5

b) Evaluate $L^{-1}\left\{\frac{S+1}{S^2+6S+25}\right\}$. 5

c) With the help of Laplace transform solve :

$\frac{dx}{dt} + 3y = 2x$, $\frac{dy}{dt} = y - 2x$, when $x(0) = 8$ and $y(0) = 3$. 5

9. Let the resultant of two forces P and Q acting at an angle α be $(2m+1)\sqrt{P^2+Q^2}$. When the forces are acting at an angle $\frac{\pi}{2} - \alpha$, the resultant is $(2m-1)\sqrt{P^2+Q^2}$. Prove that $\tan\alpha = \frac{(m-1)}{(m+1)}$. 15

10. a) The resultant of two forces P and Q acting at angle α be R. If Q is doubled, R is doubled and if Q is reversed, R is doubled. Prove that $P : Q : R = \sqrt{2} : \sqrt{3} : \sqrt{2}$.

8

b) If a particle be projected vertically upwards with a velocity μ, prove that greatest height $= \frac{u^2}{2g}$ and time to greatest height $= \frac{u}{g}$. 7

11. a) A bag contains 8 white and 6 black balls. If 5 balls are drawn at random, what is the probability that 3 are white and 2 black ? 7

b) X is a discrete random variate having probability mass function :

x :	0	1	2	3	4	5	6	7
$P(X = x)$:	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

i) Determine the constant k,

ii) Find $P(X < 6)$,

iii) What will be $P(x \geq 6)$? 2 + 3 + 3

12. a) Find the mean and standard deviation of the first n natural numbers. 8

b) Calculate correlation co-efficient from the following data : 7

x :	65	63	67	64	68	62	70	66
y :	68	66	68	65	69	66	68	65

13. a) Find out the missing frequencies from the following data, given that A.M. = 67·45 inches : 7

Height (inches)	60-62	63-65	66-68	69-71	72-74	Total
No. of Students	5	18	f_3	f_4	8	100

b) The frequency distribution of monthly income obtained by 300 workers in a factory is given below :

Monthly Income : (Rs.)	100-110	110-120	120-130	130-140	140-150	150-160	160-170	Total
No. of Workers :	16	24	59	100	41	19	10	300

Calculate Median and Quartiles. 8

14. a) Calculate the first 3 central moments and hence find the measure of skewness for the set of numbers 1, 3, 5, 7. 7

b) Find the coefficient of variation from the following data : 8

Class-interval :	4-6	6-8	8-10	10-12	12-14	14-16
Frequency :	13	10	9	5	8	5

END