INDIAN INSTITUTE OF SCIENCE
BANGALORE - 560012

ENTRANCE TEST FOR ADMISSIONS - 2009

Program : Research

Entrance Paper : Management Studies

Paper Code : **MG**

Day & Date
SUNDAY, 26TH APRIL 2009

Time
9.00 A.M. TO 12.00 NOON

GENERAL INSTRUCTIONS

1. The question paper consists of three parts: PART A, PART B, and PART C.

2. (a) Candidates seeking admission to *Research in Management* must compulsorily answer PART A and ONLY ONE of the sections in PART B.

   (b) Candidates with M.A. (Linguistics/German) seeking admission to *Research in Languages* must compulsorily answer ONLY PART C. Please note that such candidates must not attempt PART A or PART B.

3. Candidates are asked to fill in the required fields on the sheet attached to the answer book.

MANAGEMENT STUDIES

PART A

Analytical Ability and Management Aptitude

> Answer This Part Only if Your
> Are Seeking Admission to
> RESEARCH IN MANAGEMENT

Instructions

1. This part tests your *analytical ability and management aptitude.*

2. This section contains 50 questions and carries a weightage of 50% (50 marks).

3. Answers to this sections are to be marked in the OMR sheet provided.

4. For each question darken the appropriate bubble to indicate your answer.

5. Use only HB pencils for bubbling answers.

6. Mark ONLY ONE bubble per question. If you mark more than one bubble, the question will be evaluated as incorrect.

7. If you wish to change your answer, please erase the existing mark completely before marking the other bubble.

Directions: Choose the word or set of words for each blank that best fits the meaning of the sentence in questions 1 to 4.

1. Nonviolent demonstrations often create such tensions that a community that has constantly refused to _____ its injustices is forced to correct them: the injustices can no longer be _____ .

   [A] acknowledge .. ignored

   [B] decrease .. verified

   [C] tolerate .. accepted

   [D] explain .. discussed

2. There are, as yet, no vegetation types or ecosystems whose study has been _____ to the extent that they no longer _____ ecologists.

   [A] perfected .. hinder

   [B] exhausted .. interest

   [C] prolonged .. require

   [D] delayed .. benefit

3. It was her view that the country's problems had been _____ by foreign technocrats, so that to invite them to comeback would be counterproductive.

   [A] foreseen

   [B] attacked

   [C] exacerbated

   [D] analyzed

4. The significance of the Magna Carta lies not in its _____ provisions, but in its broader impact: it made the king subject to the law.

   [A] specific

   [B] revolutionary

   [C] implicit

   [D] controversial

Directions: Select the lettered pair that best expresses a relationship similar to that expressed in the original pair in questions 5 to 8.

5. Fragile : Break ::

   [A] erratic : control

   [B] flammable : burn

   [C] noxious : escape

   [D] industrial : manufacture

6. Pest : Irksome ::

   [A] sales clerk : courteous

   [B] expert : proficient

   [C] enigma : unexpected

   [D] leader : nondescript

7. Prohibitive : Purchase ::

   [A] preventive : heal

   [B] laudatory : praise

   [C] admonitory : fear

   [D] preemptory : dispute

8. Stygian : Dark ::

   [A] abysmal : low

   [B] cogent : contentious

   [C] reckless : threatening

   [D] generation : pyre

The following passage is followed by questions 9 to 12 based on its content. Answer the questions following the passage based on what is stated or implied in the passage.

The common belief of some linguists that each language is a perfect vehicle for the thoughts of the nation speaking it is in some ways the exact counterpart of the convictions of the Manchester School of Economics that supply and demand will regulate everything for the best. Just as economists were blind to the numerous cases in which the law of supply and demand left actual wants unsatisfied, so also many linguists are deaf to those instances in which the very nature of a language calls forth misunderstandings in everyday conversation, and in which, consequently, a word has to be modified or defined in order to present the idea intended by the speaker: "He took his stick—no, not John's, but his own." No language is perfect, and if we admit this truth, we must also admit that it is not unreasonable to investigate the relative merits of different languages or of different details in languages.

9. The primary purpose of this passage is to

   [A] demonstrate an interesting feature of the English language

   [B] refute a belief held by some linguists

   [C] show that economic theory is relevant to linguistic study

   [D] suggest a way in which languages can be made more nearly perfect

10. The misunderstanding presented by the author in line 9 is similar to which of the following?

   I. X uses the word "you" to refer to a group, but Y thinks that X is referring to one person only.

   II. X mistakenly uses the word "anomaly" to refer to a typical example, but Y knows that "anomaly" means "exception."

   III. X uses the word "bachelor" to mean "unmarried man," but Y mistakenly thinks that bachelor means "unmarried woman."

   [A] I only

   [B] II only

   [C] I and II only

   [D] II and III only

11. In presenting the argument, the author does all of the following EXCEPT

    [A] give an example

    [B] make a comparison

    [C] draw a conclusion

    [D] present a paradox

12. Which of the following contributes to the misunderstanding described by the author in line 9?

    [A] It is unclear whom the speaker of the sentence is addressing.

    [B] It is unclear to whom the word "his" refers the first time it is used.

    [C] The meaning of "took" is ambiguous.

    [D] It is unclear to whom "He" refers.

Directions: Choose the word or phrase that is most nearly opposite in meaning to the word in capital letters for questions 13 to 16.

13. FALLACY :

    [A] imaginative idea

    [B] unconfirmed theory

    [C] tentative opinion

    [D] valid argument

14. VENERATION :

    [A] derision

    [B] blame

    [C] avoidance

    [D] defiance

15. INVETERATE :

    [A] casual

    [B] public

    [C] satisfactory

    [D] trustworthy

16. UNDERMINE :

   [A] submerge

   [B] supersede

   [C] overhaul

   [D] undergrid

17. A hair dressers income consists of her salary and tips. Her salary is Rs. 150 per day. During one week that included a holiday, her tips were $\frac{5}{4}$ of her salary. What fraction of her income for the week came from tips?

   [A] $\frac{15}{27}$

   [B] $\frac{15}{26}$

   [C] $\frac{5}{9}$

   [D] $\frac{4}{9}$

18. If $F(x) = \int_{e}^{x} \log t\ dt$ for all positive x, then $F'(x) =$

   [A] x

   [B] $\frac{1}{x}$

   [C] $\log x$

   [D] $x \log x$

19. If S is a nonempty finite set with k elements, then the number of one-to-one functions from S onto S is

   [A] $k!$

   [B] k^2

   [C] k^k

   [D] 2^k

8

20. For what value (or values) of m is the vector $(1, 2, m, 5)$ a linear combination of $(0, 1, 1, 1)$, $(0, 0, 0, 1)$, and $(1, 1, 2, 0)$?
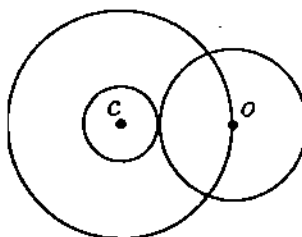
[A] -1 only

[B] 1 only

[C] 3 only

[D] Integer multiples of 3

21. In the figure below, the annulus with center c has inner radius r and outer radius 1. As r increases the circle with center o contracts and remains tangent to the inner circle. If $A(r)$ is the area of the annulus, and $a(r)$ is the radius of the circle with center o, then $\lim\limits_{r \to 1} \dfrac{A(r)}{a(r)} =$

[A] $\dfrac{2}{\pi}$

[B] $\dfrac{\pi}{2}$

[C] 0

[D] ∞

22. Which of the following CANNOT be a root of a polynomial in x of the form $9x^5 + ax^3 + b$, where a and b are integers?

[A] -9

[B] -5

[C] $\dfrac{1}{4}$

[D] 9

9

23. When 20 children in a classroom line up for lunch, Ram insists on being somewhere ahead of Peter. If Ram's demand is to be satisfied, in how many ways can the children line up?

[A] 20!

[B] 19!

[C] $\dfrac{20!}{2}$

[D] 20 × 19

24. How many integers from 1 to 1000 are divisible by 30 but not by 16?

[A] 29

[B] 30

[C] 31

[D] 32

25. Consider the following system of linear equations over the real numbers, where x, y, and z are variables, and b is a real constant.

$$\begin{aligned} x + y + z &= 0 \\ x + 2y + 3z &= 0 \\ x + 3y + bz &= 0 \end{aligned}$$

Which of the following statements are true ?

I. There exists a value of b for which the system has no solution.

II. There exists a value of b for which the system has exactly one solution.

III. There exists a value of b for which the system has more than one solution.

[A] II and III only

[B] I, II, and III

[C] I and II only

[D] II only

26. The coefficient of x^3 in the expansion of $(1+x)^3(2+x^2)^{10}$ is

    [A] 2^{15}

    [B] 2^{14}

    [C] 2^{13}

    [D] 2^{12}

27. At how many points in the xy—plane do the graphs of $y = x^{12}$ and $y = 2^x$ intersect?

    [A] 1

    [B] 2

    [C] 3

    [D] 4

28. If the ratio of men to women on a committee of 20 members is 3 to 2, how many members of the committee are women?

    [A] 8

    [B] 4

    [C] 12

    [D] 10

29. It costs a manufacturer Rs. 30 to produce a particular widget, and it is assumed that if 500 widgets are produced, all will be sold. What must be the minimum price of a widget to ensure that the profit on 500 widgets is at least Rs. 8200?

    [A] Rs. 46

    [B] Rs. 44

    [C] Rs. 47

    [D] Rs. 45

30. What is the sum of the measures of the interior angles of a decagon (10-sided polygon)?

    [A] 1440°

    [B] 1420°

    [C] 1460°

    [D] 1480°

31. If an integer is randomly selected from all positive 2-digit integers, what is the probability that the integer chosen has at least one "4"?

[A] $\dfrac{2}{7}$

[B] $\dfrac{1}{7}$

[C] $\dfrac{2}{5}$

[D] $\dfrac{1}{5}$

32. How many 3-digit positive integers are odd and do not contain the digit "5"?

[A] 284

[B] 286

[C] 288

[D] 290

Directions: Use the data from the following table to answer the questions 33 to 35.

AVERAGE AND HIGH WIND SPEED FOR SELECTED STATIONS OVER THE PERIOD 1991-2000 (kms. per hour)			SPEED AND OFFICIAL DESIGNATION OF WINDS	
Station	Average	High	Designation	kms. per hour
Delhi	9.1	71	Calm	Less than 1
Lucknow	12.6	65	Light air	1 to 3
Chandigargh	12.3	91	Light breeze	4 to 7
Bhagalpur	10.4	60	Gentle breeze	8 to 12
Chennai	7.1	49	Moderate breeze	13 to 18
Darjeeling	9.0	56	Fresh breeze	19 to 24
Mumbai	9.2	132	Strong breeze	25 to 31
Madurai	6.7	72	Near gale	32 to 38
Nasik	9.4	70	Gale	39 to 46
Bhopal	10.8	109	Strong gale	47 to 54
Cochin	9.3	58	Storm	55 to 63
Jaipur	6.7	51	Violent storm	64 to 73
Raipur	9.3	78	Hurricane	74 and above

33. Which station has a high wind speed that is the median of the high wind speed for all the stations listed?

    [A] Nasik

    [B] Delhi

    [C] Darjeeling

    [D] Cochin

34. For how many of the stations is the ratio of high wind speed to average wind speed greater than 10 to 1?

    [A] Two

    [B] Three

    [C] Four

    [D] Five

35. For those stations that have recorded hurricane winds at least once during the recorded period, what is the mean of their average wind speeds?

    [A] 11.2

    [B] 10.3

    [C] 10.4

    [D] 10.8

36. *Testifying before the Senate committee investigating charges that cigarette manufacturers had manipulated nicotine levels in cigarettes in order to addict consumers to their products, tobacco executives argued that cigarette smoking is not addictive. The primary reason they gave in support of this claim was that cigarette smoking was not regulated by the Federal Drug Administration. For the tobacco executives' argument to be logically correct, which of the following must be assumed?*

    [A] The tobacco executives lied when they claimed that cigarette smoking was not addictive.

    [B] Some addictive substances are not regulated by the Federal Drug Administration.

    [C] There is no scientific proof that cigarette smoking is addictive.

    [D] Substances that are not regulated by the Federal Drug Administration are not addictive

37. *Lycopene, glutathione, and glutamine are powerful antioxidants that neutralize the free radicals that are produced in the body as a result of routine bodily processes. An excess of these free radicals in your system causes rapid aging because they accelerate the rate of cellular damage. Aging is simply the result of this damage. Thus, to slow down aging it is necessary to supplement your diet with these antioxidants on a daily basis.* Which of the following, if true, most seriously undermines the author's contention?

[A] Most persons aren't concerned with the effects of aging until it is too late to do anything.

[B] Exercise associated with normal daily activities effectively neutralizes and dissipates the free radicals that are produced as a result of routine bodily processes.

[C] The cost of antioxidants is exorbitantly high and well beyond the budget of most consumers.

[D] Only overweight people who do not exercise on a daily basis are likely to have an excess of free radicals in their systems.

38. *Beautiful beaches attract people, no doubt about it. Just look at this city's beautiful beaches, which are among the most overcrowded beaches in the state.* Which of the following exhibits a pattern of reasoning most similar to the one exhibited in the argument above?

[A] Children who are scolded severely tend to misbehave more often than other children. Hence if a child is not scolded severely that child is less likely to misbehave.

[B] This software program helps increase the work efficiency of its users. As a result, these users have more free time for other activities.

[C] During warm weather my dog suffers from fleas more so than during cooler weather. Therefore, fleas must thrive in a warm environment.

[D] Pesticides are known to cause anemia in some people. However, most anemic people live in regions where pesticides are not commonly used.

39. *People should be held accountable for their own behavior, and if holding people accountable for their own behavior entails capital punishment, then so be it. However, no person should be held accountable for behavior over which he or she had no control.* Which of the following is the most logical conclusion of the argument above?

[A] People should not be held accountable for the behavior of other people.

[B] People have control over their own behavior.

[C] People cannot control the behavior of other people.

[D] Behavior that cannot be controlled should not be punished.

40. *A study of native born residents in Newland found that two-thirds of the children developed considerable levels of nearsightedness after starting school, while their illiterate parents and grandparents, who had no opportunity for formal schooling, showed no signs of this disability.* If the above statements are true, which of the following conclusions is most strongly supported by them?

[A] Only people who have the opportunity for formal schooling develop nearsightedness.

[B] People who are illiterate do not suffer from nearsightedness.

[C] The nearsightedness in the children is caused by the visual stress required by reading and other class work.

[D] Only literate people are nearsighted.

Directions: In questions 41 to 45 you will be given two quantities, A and B. You are to determine a relationship between the two quantities.

41. Quantity A: Time to travel 95 miles at 50 miles per hour
Quantity B: Time to travel 125 miles at 60 miles per hour

[A] Quantity A is greater

[B] Quantity A equals Quantity B

[C] Quantity B is greater

[D] Relationship Indeterminate

42. Consider a rectangle. The length of its shorter side is 8, and the length of its diagonal is 16.
Quantity A: 30°
Quantity B: measure of angle formed by diagonal and shorter side

   [A] Relationship Indeterminate

   [B] Quantity A equals Quantity B

   [C] Quantity A is greater

   [D] Quantity B is greater

43. Given $0 < -x < 10$ and $11 < -y < 20$
Quantity A: x
Quantity B: y

   [A] Relationship Indeterminate

   [B] Quantity A equals Quantity B

   [C] Quantity B is greater

   [D] Quantity A is greater

44. In a triangle PQR, angle PQR and angle QRP are equal. Length of side PQ is x, sibe QR is y and side RP is z.
Quantity A: $x + y$
Quantity B: $y + z$

   [A] Quantity A is greater

   [B] Quantity A equals Quantity B

   [C] Quantity B is greater

   [D] Relationship Indeterminate

45. Given $yz < 0$
Quantity A: $(y - z)^2$
Quantity B: $y^2 + z^2$

   [A] Quantity A is greater

   [B] Quantity B is greater

   [C] Quantity A equals Quantity B

   [D] Relationship Indeterminate

46. *Authorities concerned with mass transport in metropolitan cities are struggling with deficits. Commuters complain about delays and breakdowns, cuts in service, and fares higher than they are accustomed to paying. For all these reasons and because the price of fuel is still not prohibitive, the number of commuters using public transportation has fallen, adding to the deficits.* Which among the following statements about the relationship between the number of commuters using public transportation and the price of fuel is best supported by the above passage?

[A] With the rise in the price of fuel, there is a rise in the number of commuters using public transportation.

[B] Even if the price of fuel rises, the number of commuters using public transportation will continue to decline.

[C] The number of commuters using public transportation will rise, if the price of fuel rises to a prohibitive level.

[D] Most of the commuters using public transportation do not use fuel, therefore fluctuations in the price of fuel is unlikely to affect the number of commuters using public transportation.

47. In a particular code, the digits from 0 to 9 inclusive are each represented by a different letter of the alphabet, the letter always representing the same digit. In case the following sum

```
B O P B
+ S K B
---------
C V B Q
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holds true when it is expressed in digits, which of the following cannot be properly inferred.

[A] B cannot be 0.

[B] B must be less than 5.

[C] Q must be even.

[D] O + S must be greater than 8.

Directions: Use the information given below for Questions 48 to 50.

Three girls Joan, Rita, and Kim and two boys Tim and Steve are the only dancers in a dance program, which consists of six numbers in this order: One a duet; two a duet; three a solo; four a duet; five a solo; and six a duet.

None of the dancers is in two consecutive numbers or in more than two numbers. The first number in which Tim appears is the one that comes before the first number in which Kim appears. The second number in which Tim appears is one that comes after the second number in which Kim appears.

48. Which among the following is a complete and accurate list of those numbers that could be the last one in which Kim performs?

   [A] Four

   [B] Five

   [C] Three, Four

   [D] Four, Five

49. Rita must perform only in duets if

   [A] Kim is in number two

   [B] Kim is in number five

   [C] Tim is in number one

   [D] Tim is in number two

50. In case Steve is in number five, number four must consist of

   [A] two women

   [B] two men

   [C] Tim and a woman

   [D] Rita and a man

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18

PART B

Instructions

1. This part contains FIVE sections, each carrying a weightage of 50%(50 marks).
   Please answer ONLY ONE of the five sections that is relevant to your background.

Section I	Business Administration
Section II	Economics
Section III	Social Work
Section IV	Psychology
Section V	Management Science

2. Answers to this section are to be written in the separate answer book provided.

SECTION I
BUSINESS ADMINISTRATION
Answer any five questions.
All questions carry equal marks

1. What are the different types of work groups? Mention different stages of group development.

2. (a) What would you say are the principal societal effects of marketing other than bringing about exchanges on "goods, services and ideas"?

   (b) Is it easier or is it very difficult to develop clever marketing strategies other than it is to make them work? Explain.

3. In an era of digital watches, the Indian context promises a market for mechanical watches at least for the next few years. The organized sector accounts for about 13 million watches while the unorganized sector is estimated to be around 50 million and most of these markets revolve around quartz watches. Titan positioned and created high visibility around quartz watches and probably created an innate perception that mechanical watches may not be as reliable as quartz. In rural markets, watch is a priority purchase in the need hierarchy. Quartz watches involve replacement of battery and they may not have the ruggedness of mechanical watches. One major reason for the decline of the mechanical watch market is the availability of cheap quartz watches in the grey market. HMT manufactures mechanical watches.

   Taking into consideration the rural market for watches, how would you introduce a new brand of mechanical watches for the rural market? If you are to enhance the marketing effectiveness of an old and trusted brand like HMT in the mechanical segment, what would be your approach? (The assumption is that the market for mechanical watches would continue for a few more years).

4. (a) A Branch Manager is reviewing the advertising budget of one of his products and is considering to increase it by 25%. The present budget is Rs.2.00 lakhs per year. Sales revenue currently per year is Rs.45 lakhs. The product provides a contribution of Rs.0.35 for each rupee sale towards profit and fixed cost.

   Assuming that advertising elasticity is 0.15 for the company, if the objective is to maximize present period profits, should advertising budget be increased by 25%? Explain. (Advertising elasticity = percentage change in sales/percentage change in advertising).

   (b) Should advertising budget be reviewed and perhaps changed each time or price is changed appreciably?

5. Write short notes on the following.

   (a) Just-in-time production philosophy

   (b) Material requirements planning

6. Formulate and solve the EOQ problem detailing the assumptions made, and using an appropriate notation. Why is EOQ popular as a technique, given that demand and lead time are not likely to be deterministic in real world settings?

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SECTION II
ECONOMICS

Answer any five questions.
All questions carry equal marks

1. Discuss the standard approaches to the measurement of GDP in an Economy. How is GDP measured in India? How is it different from the standard approaches used for the measurement of national income in developed countries? Do you justify such an approach? Why?

2. How 'product differentiation' and 'price discrimination' can be used as a joint-strategy for absorbing 'consumer surplus'? Describe with some empirical examples from Indian economy.

3. Print and TV media give scope for achieving both 'economies of scale' and 'economies of scope'. Do you agree? Elaborate with empirical examples in the Indian context.

4. Analyze the importance of promoting a 'competitive market' in the place of a 'monopoly market' in the context of 'dead-weight loss' and 'technical-inefficiency'.

5. Distinguish 'cost-push' inflation from 'demand-pull' inflation. How is inflation measured in India? What are the various price indices that are prevalent in India? What purpose do they serve?

6. Indias current monetary policy aims at increasing the liquidity in the market rather than curbing economic expansion. Do you agree? Does it prove successful? Why does monetary policy often fail in achieving the objective of economic expansion? Elaborate.

****

SECTION III
SOCIAL WORK

All questions carry equal marks

1. How is economic downturn affecting employee morale? Can you suggest five initiatives to improve the morale of the employees in a medium size manufacturing firm?

2. What are the different types of work groups? Mention different stages of group development.

3. What are the different methods of data collection? Compare and contrast different methods of data collection in studying attitudes of workmen about their top management.

4. What is case work? Illustrate some principles of case work methodology in dealing with individual problems of employees.

5. Discuss briefly the scope of preventive measures mentioned in the ID Act.

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SECTION IV
PSYCHOLOGY

Questions 1-10 are compulsory (10 × 2).

1. In the human brain the hippocampus, hypothalamus and the amygdala are included in the _____ .

2. A neurotransmitter that causes anxiety disorders when found in low levels in the human brain is _____ .

3. When we complete inadequate stimuli and see them as a whole the principle is called _____ .

4. The unconditioned stimulus in the Pavlovian experiment is the _____ .

5. Tolmans discovery is related to _____ learning in rats.

6. A trait according to Cattell is cardinal if it is _____ .

7. An example of a hygiene factor in Herzbergs theory of motivation is _____ .

8. According to Freud the structure of personality consists of the _____ .

9. The force field theory is given to us by _____ and the goal theory by _____ .

10. A measure of the consistency of a rating scale in Psychometry is the _____ .

Answer any five from the following six questions (5 × 6)

11. Describe the theory that McClelland put forward.

12. Compare and contrast Pavlovian vs Skinnerian theories.

13. What are defense mechanisms? Describe any three and state why they are used.

14. Morenos contribution is important in todays collaborative world. Describe his contributions and its relevance today.

15. Draw a learning curve and describe its parts when a software programmer learns on his or her job.

16. Compare and contrast the research design you will use for a sample of children viz a viz a sample of adult consumers in the market. Describe the difference in these designs.

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SECTION V
MANAGEMENT SCIENCE

Answer both the following questions (2×5)

1. An elevator starts with 5 people in the ground floor and there are 8 floors above. What is the probability that everybody gets off at different floors?

2. Diagonalize the following matrix:

$$A = \begin{bmatrix} 2 & -2 \\ -1 & 3 \end{bmatrix}$$

Answer any four of the following questions (4×10)

3. In a sample of 10 married men 6 reported that they were happy with their lives, while in a sample of 8 single men, who were otherwise similar to the married population with respect to their age, social status, occupation, income etc. only 4 reported that they were happy with their lives. From this observation would it be fair to say that in the stated group, in general, married men are happier than their single counterparts?

4. ABC advertising agency has to come up with appropriate e-commercials for products sold by company X. Company X has a range of products targeting different age groups and income level of consumers. ABC advertising agency has prepared 4 e-commercials A, B, C and D. Consumers are classified into 4 age groups and 4 income levels. Response is a score measured by an e-questionnaire after a consumer experiences the e-commercial, with a high score indicating a high impact. Data are available for only one consumer from each of the 16 possible segments. The experimental lay-out with the responses and the e-commercials experienced by the consumers (within parentheses) in the 16 segments are as follows:

Age Groups→ Income Levels↓	I	II	III	IV
1	14 (A)	15 (B)	5 (C)	6 (D)
2	16 (B)	9 (D)	10 (A)	6 (C)
3	9 (C)	12 (A)	6 (D)	12 (B)
4	10 (D)	8 (C)	13 (B)	9 (A)

Answer the following:

(a) Write down a linear model for the responses which is possible to fit and analyse using the above data set.

(b) Write down the ANOVA table for the observed data set and infer which factors are significantly affecting the impact score.

5. In a survey of 30 IT professionals who had to quit their old job and find a new one in the wake of the current global recession, let X denote the monthly salary in the old job and Y denote the monthly salary in the new job, both in thousands of Rs., of a professional. That is for each professional there is a pair of observations on (X, Y) and one has 30 such observations $(X_1, Y_1), \ldots, (X_{30}, Y_{30})$. It is given that

$$\overline{X} = \frac{1}{30} \sum_{i=1}^{30} X_i = 56.85, \quad \overline{Y} = \frac{1}{30} \sum_{i=1}^{30} Y_i = 56.36 \quad \sum_{i=1}^{30} (X_i - \overline{X})^2 = 3746.756,$$

$$\sum_{i=1}^{30} (Y_i - \overline{Y})^2 = 2277.85, \quad \text{and} \quad \sum_{i=1}^{30} (X_i - \overline{X})(Y_i - \overline{Y}) = 2907.975.$$

Answer the following:

(a) Is there any significant evidence in saying that the IT professionals on an average tend to get less salary after being forced to quit?

(b) In a newspaper article it is qualitatively argued that, although the recession axe has fallen on all the IT professionals, it is the ones in the lower end of the salary spectrum, who have felt the maximum bite in terms of their salary-cut. Is there any significant evidence justifying the above assertion from the observed data?

6. The number of new drugs patented last year, say Y, by 20 pharmaceutical companies, is regressed on the amount of money spent in R&D, excluding the scientists' salaries, say X_1, in crores of Rs.; and the number of scientists working in their R&D laboratory, say X_2, with the following results (a number in parenthesis below a regression coefficient is its standard error):

$$Y = \begin{matrix} -4.092 & + & 2.014 \ X_1 & + & 0.341 \ X_2 \\ (0.7835) & & (0.7094) & & (0.0756) \end{matrix}$$

$$(X'X)^{-1} = \begin{bmatrix} 0.6073 & 0.0605 & -0.0353 \\ 0.0605 & 0.4979 & -0.0448 \\ -0.0353 & -0.0448 & -0.0057 \end{bmatrix}$$

$$\sum_{i=1}^{20} (Y_i - \overline{Y})^2 = 194.2 \quad \text{Residual Sum of Squares} = 17.182$$

Answer the following:

(a) What is the statistical rationale behind excluding the scientists' salaries in X_1?

(b) Show that a pharmaceutical company is expected to have more patented drugs; if it hires 20 more scientists, keeping the R&D expenses constant (excluding the scientists' salaries); than, if it increases the R&D expenses by one crore, keeping the number of scientists constant.

7. The Xecko Tool Company is considering bidding on a job for two airplane wing parts. Each wing part must be processed through three manufacturing stages, namely stamping, drilling, and finishing for which the company has limited available hours. The capacity requirement, available capacity, and unit revenue for the two wing parts and three stages are as given below:

Stage	Wing part		Capacity
	A	B	
	Unit capacity requirement		Capacity
Stamping	4	7.5	105
Drilling	6.2	4.9	90
Finishing	9.1	4.1	110
	Unit revenue		
	650	910	

(a) Develop a linear programming model and identify the production mix with the objective of maximizing the total revenue.

(b) Indicate how much slack resource is available at the optimal solution point.

(c) Determine the sensitivity ranges for the profit for wing part A and the stamping hours available.

8. (a) Is the following statement true or false? "The single-phase, single-channel model with Poisson arrivals and undefined service times will always have larger (i.e., greater) operating characteristic values (i.e., W, W_q, L, L_q) than the same model with exponentially distributed service times." Explain your answer. (W is the average time a customer spends in the total queuing system, W_q is the average time a customer spends waiting in the queue to be served, L is the average number of customers in the queuing system, and L_q is the average number of customers in the waiting line.)

(b) Why do waiting lines form at a service facility even though there may be more than enough service capacity to meet normal demand in the long run?

9. (a) How are the alternative optima and unbounded solutions indicated in the simplex procedure for a Linear programming problem?

(b) What are binding constraints, inactive constraints, redundant constraints, and dual values?

10. Write short notes on (a) UML, (b) Usability testing, and (c) COCOMO.

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PART C

LANGUAGES

Instructions

1. This part carries a weightage of 100% (100 marks).

2. Answers to this part are to be written in the separate answer book provided.

SECTION I
GERMAN

1. (20 Punkte) Schildern Sie über eine Sprachstunde, die Sie aus didaktischer Perspektive sehr schlecht fanden Warum war diese Unterrichtsstunde, nach Ihrer Meinung, misslungen?

2. (20 Punkte) "Die Grenzen der Sprache sind die Grenzen der Welt," meinte Ludwig Wittgenstein Nehmen Sie Stellung zu dieser Aussage! Begründen Sie Ihren Standpunkt mit Beispielen!

3. (30 Punkte) Erklären Sie drei von den folgenden Begriffen im Kontext des DaF-Unterrichts in Indien!

   (a) Fertigkeitsgewichtung

   (b) kommunikativer DaF-Unterricht

   (c) interkulturelle Kommunikation

   (d) lehrerzentriert

   (e) lernerorientiert

4. (30 Punkte) Nehmen Sie Stellungen zu einer Aussage und begründen Sie Ihren Standpunkt!

   (a) Deutsch ist keine globale Sprache. Inder brauchen genauso wenig wie die Engländer und Amerikaner eine Fremdsprache wie Deutsch zu lernen.

   (b) Da Inder ohnehim sehr multilingual und multikulturell sind, ist der Erwerb von Fremdsprachen für Inder sehr einfach.

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End of question paper