Civil Services (Main) Examination, 2013

MANAGEMENT

(Paper II)

Time Allowed : Three Hours **Maximum Marks : 250**

QUESTION PAPER SPECIFIC INSTRUCTIONS

(Please read each of the following instructions carefully before attempting questions)

There are EIGHT questions divided in two Sections.
Candidate has to attempt FIVE questions in all.
Question Nos. 1 and 5 are compulsory and out of the remaining, any THREE are to be attempted choosing at least ONE question from each Section.
The number of marks carried by a question/part is indicated against it.
Wherever any assumptions are made for answering a question, they must be clearly indicated.
Word limit in questions, wherever specified, should be adhered to.
Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

SECTION 'A'

1. (a)(i) In a post office, three clerks were assigned to process incoming mail. The first clerk, C_1, processes 40%, the second clerk, C_2, processes 35% and the third clerk, C_3, processes 25% of the mail. The first clerk has an error rate of 0.04, the second clerk has an error rate of 0.06 and the third clerk has an error rate of 0.03. A mail selected at random from a day's output is found to have an error. The Postmaster wishes to know the probability that the mail was processed by the first, second or third clerk respectively. Find the probabilities. **6**

(a)(ii) The odds that A speaks the truth is 3:2 and the odds that B speaks the truth is 5:3. In what percentage of cases are they likely to contradict each other on an identical point? **4**

(b) There are 50 students in a class. The regression equation of marks in Economics (X) on marks in Management (Y) is $3Y-5X+180=0$. The mean marks in Management is 44 and the variance of marks in Economics is 9/16th of the variance of marks in Management. Find the mean marks in Economics and the coefficient of correlation between marks in the two subjects. **10**

(c) A light metal company manufactures two products A and B. Each product must pass through two processing sections L and M. A good number of machines are available in both the sections. One unit of product A requires 2 hours of processing time in L and 1 hour in M. One unit of product B requires 1 hour of processing time in L and 4 hours in M. Total time available in section L is 6000 hours whereas in section M, it is 10000 hours. The net profit for product A is ₹ 3.50 per unit and for product B is ₹ 5.00 per unit. The company wishes to maximize the total net profit. (i) Formulate the problem as a linear programming problem. (ii) Find the optimum production schedule that will maximize the total net profit per week by graphical method or otherwise. **10**

(d) (i) Describe briefly each step of the six-sigma methodology popularly known as DMAIC methodology. (ii) In statistical quality control, what is the difference between 'control by variables' and 'control by attributes'? What are the most popularly used control charts used for 'control by variables' and 'control by attributes'? (iii) In Just In Time (JIT) manufacturing system, how does the 'subsequent process' signal the 'preceding process' to produce the quantity required? **10**

(e) What is an Electronic Business (e-commerce)? What is Electronic Data Interchange (EDI)? What are the elements of e-commerce and EDI? What are the benefits of e-commerce and EDI? **10**

English version compiled from published transcriptions and cross-checked across sources; not a facsimile of the official UPSC question paper.

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2. (a) A furniture company manufactures four-drawer filing cabinets in six stages. In the first stage, the boards forming the walls of the cabinet are cut; in the second stage, the front door panels are woodworked; in the third stage, the boards are sanded and finished; in the fourth stage, the boards are cleaned, stained and painted with a clear finish; in the fifth stage, the hardware for pulls, runners and fittings is installed; and in the final stage, the cabinets are assembled. Inspection occurs at each stage of the process, and the average percentages of good quality units are as follows:

Stage	1	2	3	4	5	6
Average percentage of good quality (%)	87	91	94	93	93	96

The cabinets are produced in weekly production runs with a product input of 300 units. The company later investigated the manufacturing process to identify potential improvements that would improve quality. The company identified two alternatives each costing ₹ 9,00,000 as follows:

Alternative	Quality improvement	Quality improvement
1	Stage 2: 96%	Stage 4: 97%
2	Stage 5: 97%	Stage 6: 98%

(i) Determine the weekly product yield of good quality cabinets without process improvement. (ii) Which alternative will yield greatest increase in product of good quality and why? (iii) Which alternative will be most cost-effective and why? **15**

(b) The determination of yields of three different varieties (say X, Y and Z) was subject of a recent experiment. Different blocks chosen at random from a larger group were used for this purpose. The data recorded were as follows:

Blocks / Varieties	X	Y	Z
1	12	16	30
2	5	10	18
3	7	28	35
4	10	26	51

(i) Analyze the above two-way classified data. (ii) Test for the effects of blocks and varieties at the 5% level of significance. (iii) Determine which varieties differ, if any. Is it possible to do the same with the blocks? **20**

(c) An oil company is considering a bid for a shale oil development contract to be awarded by the Central Government. The company has decided to bid ₹ 660 crores. The company estimates that it has a 60% chance of winning the contract with this bid. If the firm wins the contract, it can choose one of the three methods for getting the oil from shale. It can develop a new method for oil extraction, use an existing (inefficient process), or subcontract the processing out to a number of smaller companies once the shale has been excavated. The results from these alternatives are given in the table below:

Alternative	Outcomes	Probability	Profit (₹ in crores)
Develop new process	Great success	0.30	3,600
Develop new process	Moderate success	0.60	1,800
Develop new process	Failure	0.10	-600
Use present process	Great success	0.50	1,800
Use present process	Moderate success	0.30	1,200
Use present process	Failure	0.20	-240
Subcontract	Moderate success	1.00	1,500

The cost of preparing the contract proposal is ₹ 12 crores. If the company does not make a bid, it will invest in an alternative venture with a guaranteed profit of ₹ 180 crores. (i) Should the company make the bid? (ii) If yes, what method for oil extraction should it adopt? **15**

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3. (a) Product A is assembled from two parts B and C. One unit of A is assembled from 1 unit of B and 2 units of C. Each item requires one or more operations and the lead time everywhere is assumed negligible. Part C requires first machining operation followed by heat treatment. Part B requires only machining operation. Product A requires an assembly operation. The Master Production Schedule (MPS) for product A is given in the table below:

Month	1	2	3	4	5	6
Product A (in units)	100	150	100	200	125	100

The process time data is shown in the table below:

Operation	Item	Work center	Standard time/unit (in hr)
10	C	Machining	0.5
20	C	Heat treatment	2.0
30	B	Machining	1.0
40	A	Assembly	0.5

(i) What will you recommend as normal capacity at each work center? (ii) If the setup cost to produce a batch of product A is ₹ 5,000, the manufacturing cost of the product A is ₹ 2,000 per unit and the inventory holding cost per unit per year is 20% of the product cost, what Master Production Schedule (MPS) will you recommend to minimize sum total of setup and inventory holding costs? (iii) Given the MPS in the table above, what is the schedule of gross requirements of part C? **20**

(b) (i) Forecast of demand for cakes made by a baking company needs to be made with accuracy. The bakery markets cakes through a chain of food stores. It has been experiencing over- and under-production due to forecasting errors. The demand in dozens of cakes for the past four weeks is shown in the table below. Cakes are made for sale on the following day, for example, Monday's cake production is for Tuesday's sales and so on. The bakery is closed on Saturday. So Friday's production must satisfy demand for both Saturday and Sunday:

Day	4 weeks ago	3 weeks ago	2 weeks ago	1 week ago
Monday	2200	2400	2300	2400
Tuesday	2000	2100	2200	2200
Wednesday	2300	2400	2300	2500
Thursday	1800	1900	1800	2000
Friday	1900	1800	2100	2000
Saturday + Sunday	2800	2700	3000	2900

Using a weighted average of 0.40, 0.30, 0.20 and 0.10 for week 1, week 2, week 3 and week 4 ago respectively, what is the weighted average forecast for Monday of the current week? (ii) The bakery also produces bread and is planning its purchases of ingredients for bread production. If bread demand forecast for last week had been 22000 loaves, and only 21000 loaves were actually demanded, what would the forecast be for this week using exponential smoothing method with smoothing coefficient $\alpha=0.10$? (iii) In part (ii) above, if actual demand in current week turns out to be 21500, what will be the forecast for the next week with exponential smoothing method, using $\alpha=0.10$? **15**

(c) XYZ is famous for homemade pizzas which are crisp with thin crust and varied toppings giving the pizzas fabulous tastes. XYZ is revamping its order processing and pizza-making process. In order to deliver fresh pizza fast, six work elements must be completed as shown in the table below:

Element	Description	Precedence	Time (in min)
A	Receive order	–	2.0
B	Shape dough	A	1.0
C	Prepare toppings	A	2.0
D	Assemble pizza	B, C	3.0
E	Bake pizza	D	3.0

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F	Deliver pizza	E	3.0

(i) Construct a precedence diagram for the process. (ii) If the demand is 120 pizzas per night (5:00 pm to 1:00 am), compute the cycle time for the process. Compute the lead time for the process. (iii) What is the theoretical minimum number of workstations needed to achieve the required production? (iv) How will you balance the production line to produce and deliver 120 pizzas per night? What is the actual minimum number of workstations needed?

4. (a) An antiseptic mouthwash is one of the major products of WL Company. Materials collected from eucalyptus farms are shipped to WL's manufacturing plants. The mouthwash is purchased by thousands of retail stores, some of them are giants like Walmart and many are small. The manufacturing plant must forecast the overall demand to avoid high inventories or shortages. WL decided to use Demand Planning Decision Support System (DSS) from a well-known vendor of IT software. Used with other products in the vendor's Supply Chain Planning Suite, the system analyzes manufacturing, distribution and sales data against expected demand and business climate information to help WL decide how much mouthwash (and other products) to produce and distribute and how much each raw ingredient is needed. For example, the model anticipates the impact of promotions or of a production line being down. The sales and marketing people at WL meet monthly with employees in finance, procurement and other departments. The groups enter the expected demand for mouthwash into a Capacity Planning DSS supplied by another firm. The system schedules the production of mouthwash in amounts needed and generates electronic purchase orders for WL's suppliers. The innovative Collaborative Planning, Forecasting and Replenishment system (CPFR) program launched a few years ago has led to supply chain excellence at WL. During CPFR pilot, WL increased its products' shelf fill rate–the extent to which a store's shelves are fully stocked–from 87% to 98%, earning the company about US $ 8 million a year in additional sales or equivalent of a new product launch. Later WL decided to use Internet to expand the CPFR program to all its suppliers and retail partners. (i) How are Supply Chain Management (SCM) and Enterprise DSS related? (ii) In WL case, how do Demand Planning DSS, Capacity Planning DSS and CPFR result in supply chain excellence? (iii) How is second generation ERP different from first generation ERP? (iv) Can first generation ERP help achieve supply chain excellence? Can second generation ERP help do this? **20**

(b) Design a model for banking application. Banks have customers. Banks are identified by a code, name and address of the main branch. Customers are identified by cust_id, name, address and phone number. A customer can have one or more bank accounts. Accounts are identified by an account number, account type (savings or current) and a balance. Customers can avail loans. Loans are identified by loan_id, loan_type (home, car, personal) and an amount. Banks have branches. Branches are identified by Branch_ID, Branch_Name, Address. Accounts and loan are related to branches. (i) Identify the entities. (ii) Find the relationship among the entities. (iii) Show the cardinality ratio of the relationship. (iv) Identify the key attributes and other attributes of each entity. (v) Write relational scheme for branch and bank. **15**

(c) (i) Name three principal methods of creating database. Describe any two methods in detail. (ii) What are the key differences between traditional commerce and e-commerce? (iii) Explain the required features of a B2B platform for e-commerce. **15**

SECTION 'B'

5. (a) In the context of business strategy analysis, what is 'growth matrix'? How do 'product scope' and 'market scope' analysis help in developing the growth matrix for a business? How do these help define 'mission' of a business? **10**

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(b) What are the advantages and disadvantages that Multinational Corporations (MNCs) bring to a host country? How do you distinguish between MNC and Transnational Corporation (TNC)? **10**

(c) In analyzing competitive strategy, what is the need to analyze the value chain of a company? Why is it necessary to analyze the competitive forces in an industry? How do these help in formulating competitive strategy? **10**

(d) In international trade theory, how is 'theory of absolute advantage' different from 'theory of comparative advantage'? Which of these is more preferred? Why? **10**

(e) What do you understand by the term 'public policy'? How is it classified? What are the important elements of public policy? **10**

6. (a) Read the case below and answer the questions based on it: Long ago ABC Company had a single store in USA selling premium roasted coffee. Today it is a global roaster and retailer of coffee with over 17000 stores in over 50 countries. In 1980, the company experimented with coffeehouse format to sell the company's premium roasted coffee and freshly brewed coffee beverages along with a variety of pastries, coffee accessories, teas and other products in tastefully designed coffeehouse setting. The company hired, trained, motivated and compensated employees for superior customer service giving stock option grants and medical benefits to even part-timers. In 1995, with over 700 stores in US, the company explored foreign opportunities and licensed its format in Japan. Realizing that pure licensing would not give it the control needed, the company set up a 50/50 Joint Venture (JV) with a local retailer XYZ. The company initially invested US $ 10 million, its first FDI. ABC transferred some employees to the Japanese operation to replicate ABC's experience in Japan. Training of Japanese store managers, employees, design parameters of the stores, stock options for Japanese employees were all meant to replicate the ABC's experience. By 2006, the company had 600 stores in Japan. ABC continued with its overseas expansion aggressively. In 1998, it purchased a British coffee chain with 60 retail outlets for US $ 84 million. In late 1990s, it opened stores in Taiwan, China, Thailand, New Zealand, South Korea and Malaysia. Starting initially with licensing and replication of other practices followed in Japan, the company converted several of these into JVs or wholly owned subsidiaries, partly due to funding problems of local partners. By 2002, the company expanded into Europe, beginning with a JV with largest Swiss food service company. This was followed by JVs in other countries. In 2006, the company saw a major opportunity in China, which it believed to be the largest outside USA. (i) Why did ABC become disenchanted with licensing strategy? (ii) Why does ABC prefer to expand internationally through local joint ventures? (iii) What are the advantages for ABC of entry through joint ventures over owned subsidiaries? (iv) Which theory of Foreign Direct Investment (FDI) best explains the international expansion strategy adopted by ABC? **30**

(b) In the year 2004, inward FDI accounted for some 24% of capital formation in Ireland, but only 0.6% in Japan. What do you think explains the difference in FDI inflows into the two countries? **10**

(c) Project management in India, in particular of projects in infrastructure sector, has been characterized by severe time and cost overruns. What are the major factors accounting for these overruns? Currently, what are the estimates of these overruns? **10**

7. (a) Read the case below and answer the questions based on it: An ice cream manufacturing company X had achieved remarkable success in the State where the company had established its manufacturing plant. Driven by the quality, easy availability, image of innovative value-added product and packaging, and very good brand promotion efforts, the manufacturer gained rapid recognition for his products in the State and soon became the dominant player in the market, even though the prices charged were higher than most of the many competing brands in the State. In fact, the company's brand had become **20**

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synonymous with the ice cream itself. Slowly the brand began gaining popularity outside the State as well. While earlier the company sold the product outside the State through select outlets, it was clear that there was strong potential for the company to expand greatly outside the State and eventually emerge as a national player. The company found that it could not hope to cash in the growing popularity of the brand by just expanding manufacturing facilities in the State and distributing the product on nationwide basis. Throughout the nation, there were numerous manufacturers of ice cream, majority of them preferred to remain as local or regional players, where they enjoyed good market positions. Very few brands had become truly national brands. Companies that operated nationally offered generally attractive prices, easy availability and convenience packaging. They had large capacities, set up manufacturing facilities at a number of locations nationwide and developed strong distribution and supply networks. They also invested heavily in building brand image nationwide. All national players faced intense competition from local/regional players as well as some niche players. (i) By what strategy did the company grow in its home State? (ii) Can it compete nationally with the same strategy or will it need to modify the strategy to emerge as a successful national player? (iii) What are the distinguishing differences between company X strategy and the strategy adopted by large national players?

(b) What do you understand by the term 'joint sector'? What is the need for joint sector when there are other well-defined sectors to promote industrial development? What are the different types of Joint Sector Enterprises (JSEs)? What type of JSE has been found to be suitable for India? Give some examples of joint sector enterprises in India. **15**

(c) Why is it necessary to have price and distribution controls of essential commodities in India? How do these controls help manage demand and supply of commodities? What problems do 'controls' cause? What are the key steps taken to improve the public distribution in India? **15**

8. (a) A textile mill was inspected by government safety inspection team and found to be in violation of a number of safety regulations. The inspectors ordered the mill to alter some existing machinery to make it safer (i.e., add safety guards, etc.); purchase some new machinery to replace older, dangerous machinery; and relocate some machinery to make safer passages and unobstructed entrances and exits. The mill was given only 35 weeks to make the changes. If the changes were not made by then, the mill would be fined ₹ 2 crores. The mill determined the activities to be completed, prepared three time estimates for each activity namely: pessimistic time, optimistic time and most likely time. Table below gives the data compiled by the mill:

Activity	Description	Activity (immediate predecessor)	Time estimates (in weeks): a	m	b
1	Order new machinery	–	1	2	3
2	Plan new physical layout	–	2	5	8
3	Determine safety changes	–	1	3	5
4	Receive equipment	1	4	10	25
5	Hire new employees	1	3	7	12
6	Make plant alterations	2	10	15	25
7	Make changes in existing machinery	3	5	9	14
8	Train new employees	4, 5	2	3	7

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9	Install new machinery	4, 5, 6	1	4	6
10	Relocate old machinery	4, 5, 6, 7	2	5	10
11	Conduct employee safety orientation	8, 9, 10	2	2	2

(i) Determine the expected duration of the project. (ii) Identify the critical activities in the project. (iii) What is the probability that the mill will be fined ₹ 2 crores?

(b) Assume two countries A and B have the same amount of resources which can be used to produce either rice or cocoa. A total of 200 units of resources are available. Country A needs 10 resources to produce 1 tonne of cocoa and 20 resources to produce 1 tonne of rice. Country B takes 40 resources to produce 1 tonne of cocoa and 10 resources to produce 1 tonne of rice. Assume a linear relationship between production and resources consumed. (i) Draw the Production Possibility Frontier (PPF) for countries A and B respectively. (ii) Assume both countries engage in trade with each other and decide to produce only that item in which they have absolute advantage. Assume they can swap 1 tonne of rice for 1 tonne of cocoa and the unit price of rice and cocoa are equal. Country A exports 6 tonnes of cocoa to country B and imports 6 tonnes of rice in return. What will be the change in combined output of cocoa and rice of the two countries as a result of the trade, compared to what would have been possible before specialization and trade, with each country devoting half of its resources each to produce cocoa and rice? **15**

(c) What do you understand by the term ‘privatization’? What is the rationale for privatization? What have been various methods adopted for privatization in India? Does ‘disinvestment’ alone constitute privatization? **10**

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