

**NANYANG TECHNOLOGICAL UNIVERSITY**

**SEMESTER 1 EXAMINATION 2014-2015**

**EE4717 / IM4717 – WEB APPLICATION DESIGN**

November / December 2014

Time Allowed: 2 hours

**INSTRUCTIONS**

1. This paper contains 1 question and comprises 6 pages.
  2. Answer 1 question.
  3. This is an open-book examination.
  4. Unless specifically stated, all symbols and acronyms have their usual meanings.
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1. A shop selling car accessories would like to have an online shop. A visitor to the online shop can browse and order items. The items ordered from the online shop would be delivered to the address provided by the customer. There are two types of customers: new and returned customers. A new customer will be automatically registered with a buyer's account after completing the first order. A returned customer already has a registered buyer's account. The returned customer can enjoy a 5% discount on the current order if he/she has accumulated a total order amount of at least S\$200 in his/her most recent 10 purchases. He/she can still enjoy this discount if he/she has made less than 10 past purchases provided that the accumulated order amount is equal or above S\$200. The delivery charge is fixed at \$30 island-wide and there is no delivery to overseas orders. This charge will be waived if the order is above S\$100.

The sale items in the shop are categorized into car-care, car-electronics, and tyres. The user navigates pages of product catalogue and selects an item for purchase by specifying the quantity and then clicking the “add-to-cart” button next to the item. On checking out, the visitor is asked to enter his/her email address. Then, a new web page, known as the order-form page, showing the current order will appear. If the visitor is a returning customer with an existing buyer's account, the customer details and the delivery address are shown in the order-form page. If the visitor is a new customer, the fields for customer name and delivery address will be empty in this form. The total amount of the order less discount and/or delivery charge, if eligible, is shown in the order-form. The customer will then be asked to confirm the order-form. Once the order form is confirmed, the order details will be entered into the database and an email acknowledging the order will also be sent to the customer.

Note: Question No. 1 continues on page 2.

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- (a) Analyze the scenario described in the question, identify the task(s) the application should support, and then draw a sitemap of the web application. You are free to make any further assumptions in your design but they must be stated in your answer. (15 Marks)
- (b) Sketch the storyboard(s) to illustrate the workflow(s) of the identified task(s) of the web application. (15 Marks)
- (c) The design of the page-layout for the order-form page is shown in Figure 1 on page 5. Study the figure and take note of the following design information:
- (i) The top of the page is the banner area with a logo image (filename: "logo.gif") in the centre. The height of the banner area is 80px.
  - (ii) The ordered items in the shopping cart are displayed in a table centered in the content area (i.e. below the banner area). The border of the table is a 5px-thick solid line with a color value of "#000066", and the table width is 600px. The table header has a background color value of "#000066" and a text color value of "#eaeaea". The even rows have a background color value of "#eaeaea".
  - (iii) The entire page has a background color value of "#F5F5F5". The font-family is "Verdana, Arial, sans-serif".
  - (iv) The page content area is centered and occupies 80% of the browser window width, but subject to a minimum width of 960px. The background color value is "#E2D2B0". However, the area between the banner and footer has a background color value of "F5F5DC".
  - (v) The footer area is at the bottom of the page, and its background value is "#D2B48C" and text color is black.
  - (vi) The SUBMIT button below the delivery address shows the text message "Confirm Order".

You may make further assumptions after studying Figure 1.

Write the HTML5 and CSS3 codes to implement the design. The CSS3 codes should be in an external CSS file and it is linked in the HTML page.

(20 Marks)

Note: Question No. 1 continues on page 3.

- (d) To facilitate the registration of a buyer's account, customer particulars and contact information are validated at the browser before submission to the web server. Write the regular expressions and JavaScript statements to validate the following customer data entries:
- (i) Customer's name: It should begin with one or more upper case characters and may contain spaces and hyphen ('-'), but not digits and period ('.') .
  - (ii) Customer's email: It should comprise a username followed by a domain name, separated by a single '@' character symbol. The username is in word characters, which include period ('.') and hyphen ('-'). The domain name may have one or more address extensions, each separated by a period ('.'), and in word characters. The last address extension, however, should have 2 and up to 4 characters, excluding period ('.') and hyphen ('-'), and should not include any digits.
  - (iii) Customer's phone number: It should consist of 8 numeral digits and begin with the digit '6', '8' or '9'
  - (iv) Customer's postcode: It should consist of 6 numeral digits.

In your answer to this part of the question, you only need to rewrite the lines in the answer to question 1(c) affected by the adding of the JavaScript codes. The JavaScript functions should be in external files ending with the .js file extension and linked in the HTML codes.

(15 Marks)

- (e) To support the business functions and transactions of online sales and purchases, a database is required.
- (i) Design the database schemas to support the following functions of the online shop. Clearly indicate the primary and foreign keys in each table of the schemas.
    - Storing records of customer's particulars as reflected in the Customer Information section in the order-form of Figure 1.
    - Tracking daily sale orders by amount and date of orders.
    - Tracking items ordered and the item quantities.
    - Tracking stock level and product pricing.
  - (ii) Write the SQL command for the creation of a Customers table. Clearly indicate the data types of the attributes, and the data field that is auto increment. Indicate which one of the attributes is a primary key.
  - (iii) Write the PHP script to generate a SQL query to retrieve up to the last 10 purchase orders made by a customer and compute the total amount of the purchases.

(15 Marks)

Note: Question No. 1 continues on page 4.

- (f) Figure 2 on page 6 shows the sequence of shopping cart operations and various states of transactions between the catalogue table and the shopping cart. Figure 2(a) shows the catalogue table with the number of items to be purchased for the selected items. Figure 2(b) shows the selected items in the shopping cart and the total amount and quantity of items to be purchased. The customer may return to the catalogue page of Figure 2(c) to continue shopping. He/She may make further selections and revise his/her order. On checking out, an order form based on the final state of the shopping cart of Figure 2(d) will be generated.
- (i) Explain how the state of variables is preserved across a number of transactions in different pages. Write the PHP script, along with the relevant function, to store a variable for “item\_qty=5” such that the variable persist throughout the shopping cart operations.
- (ii) Figure 2(a) shows a PHP generated output page of the catalogue table. The table takes in inputs for quantity of items to be ordered. The input fields under the “Quantity” column are created using HTML  elements. Explain how input values of these elements are passed onto PHP \$\_SESSION variables. Write the relevant scripts to illustrate your answer.

Hint: There are multiple possible solutions.

(20 Marks)

Note: Question No. 1 continues on page 5.

The screenshot shows a web-based order form for 'ABC Car Accessories Pte Ltd'. At the top, there's a header bar with a logo and a search bar. Below it is a banner for 'ABC Car Accessories Pte Ltd'. The main content area contains the following sections:

- Items in the Shopping Cart**: A table showing items ordered:

Item No.	Item Description	Unit Price	Qty. Ordered	Cost
1	product a	\$10	4	\$40
2	product b	\$20	2	\$40
3	product c	\$3.50	4	\$14
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...
- Total Amount Ordered : \$XXXXX**
- Discount Enjoyed : \$XXXXX**
- Delivery Charge : \$XXXXX**
- Total Amount Payable : \$XXXXX**
- CUSTOMER INFORMATION**: Fields for Name\*, E-mail\*, and Phone\*.
- Delivery Address\*(Singapore Address Only)**: Fields for Blk, Room Unit No., Street, and Postcode.
- Buttons**: 'Confirm Order' and 'Copyright © 2014 ABC Car Accessories Pte Ltd'

Annotations with arrows point to specific elements:

- An arrow points from the text 'logo.gif' to the company banner at the top.
- An arrow points from the text 'table' to the shopping cart table.
- An arrow points from the text 'html form' to the customer information and delivery address sections.

**Figure 1**

Note: Question No. 1 continues on page 6.

**(a) Catalogue Table**

**(b) Shopping Cart**

The left window (a) shows a catalogue table with four items:

Item Description	Price	Quantity	Action
AutoGlym Super Resin Polish	\$24.95	2	Add-to-Cart
Bosch Car Battery S3	\$199.95	1	Add-to-Cart
Smartphone Mirror Link System	\$299.99		Add-to-Cart
Pirelli HP Cinturato P1	\$110.00	4	Add-to-Cart

All prices are in imaginary dollars.

The right window (b) shows the shopping cart with the same four items and a total of \$689.85:

Item Description	Price	Quantity
AutoGlym Super Resin Polish	\$24.95	2
Bosch Car Battery S3	\$199.95	1
Pirelli HP Cinturato P1	\$110.00	4
<b>Total:</b>	<b>\$689.85</b>	7

[Continue Shopping](#) or [Empty your cart](#)

**(c) Returning page of Catalogue Table**

**(d) Final state of Shopping Cart**

The left window (c) shows the catalogue table again with the same four items.

The right window (d) shows the shopping cart with all four items plus two additional items (Smartphone Mirror Link System and Pirelli HP Cinturato P1), totaling \$989.84:

Item Description	Price	Quantity
AutoGlym Super Resin Polish	\$24.95	2
Bosch Car Battery S3	\$199.95	1
Smartphone Mirror Link System	\$299.99	1
Pirelli HP Cinturato P1	\$110.00	4
<b>Total:</b>	<b>\$989.84</b>	8

[Continue Shopping](#) or [Empty your cart](#)

**Figure 2. Sequence of online shopping cart operations**

END OF PAPER



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Please read the following instructions carefully:

- 1. Please do not turn over the question paper until you are told to do so. Disciplinary action may be taken against you if you do so.**
2. You are not allowed to leave the examination hall unless accompanied by an invigilator. You may raise your hand if you need to communicate with the invigilator.
3. Please write your Matriculation Number on the front of the answer book.
4. Please indicate clearly in the answer book (at the appropriate place) if you are continuing the answer to a question elsewhere in the book.